
The Elements of *R E S E A R C H*

By

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To
CORDELIA
With Love and Gratitude

Preface

THIS BOOK derives from a background of more than eighteen years of experience with graduate students, as well as personnel and institutional research in a college department for educational investigation. Many of the research methods and techniques discussed have been suggested by the students themselves. All have been tried out and evaluated in work with individuals and groups working toward higher academic degrees. The material presented is intended to be of value to the beginner in ordered reflective thinking rather than to the experienced and seasoned scientist. In fact, perhaps one of the most important values of the book may be found in its elementary character.

The book is intended for use in the graduate departments of institutions of higher education. It is believed that it may also serve as a handbook for any student in a classroom, an administrative office, or a research department, who wishes to study his problems objectively. It may be put into the hands of study groups and committees as a guide for reflective thinking in the conception and solution of research projects.

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The Elements of
R E S E A R C H

CHAPTER I

Reflective Thinking, Science, and Research

IT IS SAFE to assume the universal need for a reflective attitude on the part of any worker toward his task, of an individual toward his environment. Unthinking activity is governed too completely by tradition or by emotion. It may result in doing well what has been done just as it has always been done, if the feeling tone is favorable. But, unless someone in the group is capable and willing to look for and recognize new problem situations and attempt their solution, no improvement will appear in process, in product, or in human relationships involved.

Very probably primitive cultures have not illustrated this attitude of planned reflection. The content of the curriculum for youth inducted into membership in the tribe consisted of the wisdom of the old men. Primitive life was largely without effective reflective thought, until some intelligent individual conceived of a new solution for an old problem. Then perhaps civilization began. Of course, the obviously unthinking attitude and practice of men in modern society should be pointed out also. Note the blind attachment of the majority to the slogans of politics, religion, and other social institutions. And few, even of the so-called "upper" educated groups, ever do much careful, ordered thinking. We refuse to delay action based on habit or emotion until evidence can be considered. Real reflection is hard work which it is too easy to let someone else do. Only when compelled by the discipline of consequence, do we think before we act.

The history of the rise of reflective thinking cannot be traced here. A number of popular statements have given the trend in outline.¹ The hold of Aristotle's organized information and generalizations on the

¹ H. G. Wells, *The Outline of History*. New York: Garden City Publishing Company, 1920, pp. 725-734; Walter Lippmann, "The Creative Principle in Modernity," *A Preface to Morals*. New York: The Macmillan Company, 1935, Chap. XII, Sec. 2, pp. 235-241; J. H. Robinson, *The Mind in the Making*. New York: Harper & Brothers, 1921, Sec. IV.

medieval mind is well known. Disagreement with his written word was not permitted in the first universities. And no doubt the student from Italy, who is said to have preferred the lion that he had seen to Aristotle's description, suffered solitary confinement until he would conform. It was not until the time of Francis Bacon (1561-1626) that definite suggestions² began to bear fruit in a more effective attitude toward the problems of living. His irrepressibly curious mind doubted everything in terms of endless induction and comparison. His exposition of better ways for considering and doing things gave impetus to a swifter shift of methods of attaining human knowledge from authority, through shallow speculation, to hypothesis and experimentation, although his own method did not include deduction.³

If this is a category of excellence (authority, speculation, thinking) and if the criterion for human advancement is less activity based solely on what has been and more and more recognition of problem situations in terms of new hypotheses, just what are the elements of reflective thinking and how may further progress be made toward a more general acceptance of this better method of inquiry? First of all, an analysis should be made of the concepts *reflection*, *science*, and *research*.

It is the thesis of this discussion that some degree of identity should and will be found among these three terms. Where do the boundaries of definition coincide, and where is there overlapping? Which is the determining member of the trio? What relationships appear in the group? How does the normal mind act in the process of reflective thought? What are the places of science and of thinking in accepted methods and types of research? These and other questions of an increasingly specific nature will be considered in succeeding chapters. The point of view of the neophyte will be taken with frequent reference to the attitudes and activities of the master thinkers of past and present.⁴

A. The Thinking Process

The normal human mind often acts in terms of problem situations. If these are familiar and their solution is well known and accepted,

² Francis Bacon, *Novum Organum; or, True Suggestions for the Interpretation of Nature*. London: George Bell and Sons, 1894.

³ W. A. McCall, *How to Experiment in Education*. New York: The Macmillan Company, 1923, p. 2; Florian Cajori, "Baconian Method of Scientific Research," *Scientific Monthly*, 20: 85-91, 1925.

⁴ J. N. Leonard, *Crusaders of Chemistry: Six Makers of the Modern World*. New York: Doubleday, Doran and Company, 1930; Philipp Lenard, *Great Men of Science: A History of Scientific Progress*. New York: The Macmillan Company, 1933; Carl Murchison, editor, *A History of Psychology in Autobiography*. Worcester, Mass.: Clark University Press, 1930, 1932, Vols. I, II.

the individual reacts without thought, in terms of neural paths already established. This is tradition or habit. At each advance of life's experience, this body of settled, habitual, unthinking possibilities is added to until, in many realms of living, activity is smooth and continuous without the halt and reflect of the problem situation. Lacing and tying shoestrings, the routine of shaving, reading from the printed page, attending church services, taking attitudes toward friends, foreigners, or foes—each situation in the normal individual has its pattern of response, once a matter of problem solving more or less complex, now devoid of any degree of reflection, until some new element is injected.

An analysis of this normal response to a problem situation may be made in an attempt to discover the elements of the process of reflective thinking. Just what happens at each step? Are these steps sequential in terms of time? What is their relationship? The analysis furnished by John Dewey⁵ of Teachers College, Columbia University, may be used as definite and understandable.

STEPS IN REFLECTIVE THINKING

1. The occurrence of a felt difficulty.
 - a. In the lack of adaptation of means to end.
 - b. In identifying the character of an object.
 - c. In explaining an unexpected event.
2. Definition of the difficulty in terms of a problem statement.
3. Occurrence of a suggested explanation or possible solution—a guess, hypothesis, inference, or theory.
4. The rational elaboration of an idea through the development of its implications, by means of the collection of data (evidence).
5. Corroboration of the idea and formation of a concluding belief through experimental verification of the hypothesis.

The generalization coming out of the act of thought having been accepted, the normal mind immediately inquires, how good is this conclusion? How general is it in terms of time and place? Is it true everywhere, as well as here? Will it be true ten years hence? No doubt this mind process is implied in Dewey's fifth step, but T. L. Kelley of Harvard University wishes to consider it specifically, as the final and crowning act in the process of reflection. He calls attention to the following fact.

After the solution has been found to work, there is a mental looking forward, the general purpose of which is:

⁵ John Dewey, *How We Think*. Boston: D. C. Heath and Company, 1933, p. 12.

6. To appraise this new solution in the light of future needs.⁶

An attempt has been made in Figure 1 to illustrate the thought process roughly in graphic form. Search for *ultimate truth* may

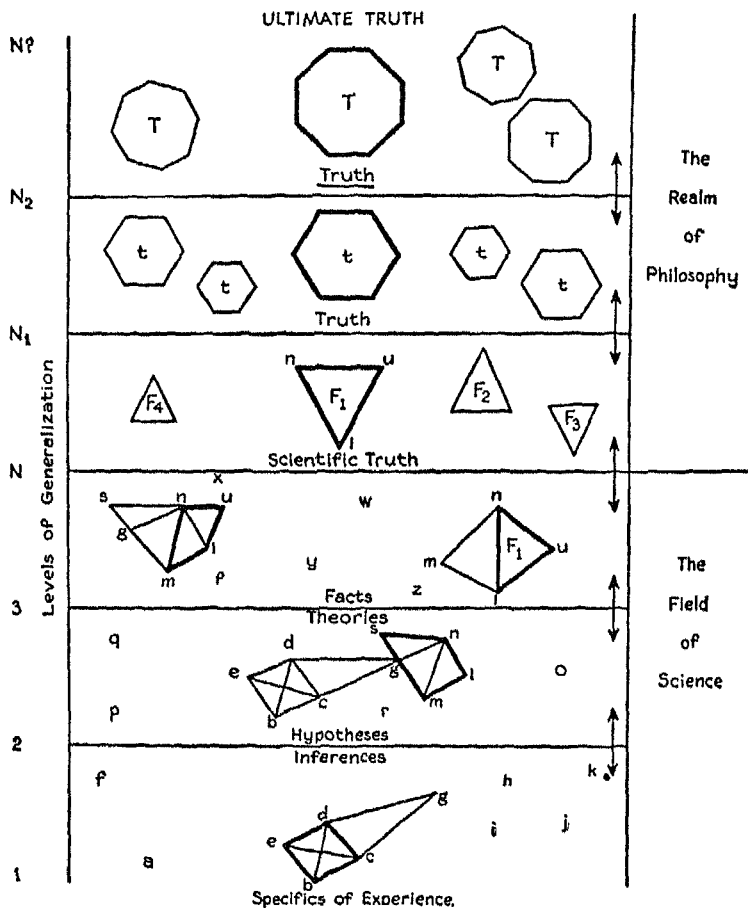


Figure 1. CONTINUITY OF THE PROCESS OF REFLECTIVE THINKING IN THE SCIENCE-PHILOSOPHY METHOD

proceed from the specific of sense experience, through repeated

⁶ T. L. Kelley, *Scientific Method: Its Function in Research and in Education*. New York: The Macmillan Company, 1932, p. 5; John Dewey, *The Quest for Certainty: A Study of the Relation of Knowledge and Action*. New York: Minton, Balch and Company, 1929, and *Logic: The Theory of Inquiry*. New York: Henry Holt and Company, 1938.

processes of synthesis and deductive trial, on to higher and higher levels of generalization. In the "big booming, buzzing confusion" of the countless items of environment impinging upon consciousness, represented in Figure 1 by the inadequate lettering *a* to *k* at the bottom of the graph, certain relationships begin to appear among the items *bedgc*, so that a first tentative guess at meaning, a hypothesis, results. This very small generalization is examined deductively (see the arrows to the right) in the light of previous known experience. This is the practical test, which answers the question, "Will it work?" At the same time, new more or less related items are gathered by the inquiring mind, as evidence on the value of the hypothesis. These are represented by the letters *l* to *s*, inclusive. On this level of thought, the tentative conclusion (generalization) takes rather new form. Only one item of the first group (*g*) remains; and the scientific guess, which may be a real theory, or principle, takes the form of *mgsl*. On the third level, two processes of selection and integration are represented to show that at every level many tentative generalizations may appear, each being finally rejected in favor of the next, which results from newer increments of experience subjected to deductive trial.

The final fact on this level, which is truth so far as the scientific process is concerned, may be represented by the triangle *lnu* (F_1), although it is, of course, impossible to say at just what point in the thought process activity in the field of science merges into philosophic thought. Wherever this is, the raw material for the reflection of philosophy consists of the best generalizations of science, represented in Figure 1 by the *F* triangles, " F_1 ," " F_2 ," and so on, coming from related fields of inquiry and resulting from similar scientific activity. At succeeding levels in this realm of higher thought, these entities are subjected to deductive proof, becoming constantly of greater general value as little *truths* (*t*), and finally approaching the largest possible generalization of all, ULTIMATE TRUTH. But they seldom (and possibly never) reach it, because the constantly changing conditions of human society and the new discoveries of specifics of information in the so-called exact realms of knowledge frequently start another ferment of thought that ripples up through the succeeding levels of generalization and changes the contour of the basic material with which philosophy must work. This shifts the general trend of its progress toward another statement of tentatively final truth.

This figure is, of course, too graphic to be a true account of the continuity of the thought process from first sense experience to the largest philosophical generalization possible. But it calls attention to the trend toward this ultimate goal of thought and hints at the oscillating action of induction and deduction at every level (see the

arrows), which results in the tentative establishment of scientific guesses leading constantly toward more general truth.

It is seen that this science-philosophy process operates on higher and higher and more complex levels of generalization. A complete act of thought may occur on any level, using the more specific, narrower concepts of science or the wider, more inclusive generalizations of philosophy. Reflective thinking is possible and occurs on all levels. The process is the same. The material used in thinking differs in generality.⁷ (See Chapter X).

Dewey later restated this fact of the continuity of the thought process. ". . . there is no competition between science and philosophy. They exist, so to speak, in distinct, although connected, dimensions. As far as knowledge is concerned, the primacy and ultimacy of science is admitted. For what 'science' means is simply the most authentic knowledge of nature, man, and society that is possible at any given time by means of the methods and techniques then and there available. The work of philosophy as critical and constructive does not attempt to furnish additional knowledge beyond the reach of science. Its concern is rather with values and ends that known facts and principles should subserve."⁸

Attention is again called to the well-known fact that the basic material available for thought on any level of generalization is never adequate. After every pause for analysis, integration, and deductive verification, a leap more or less in the dark must be made, if any conclusion at all, however tentative, is to be reached. This is the deductive leap, or the "leap of faith," as it is sometimes called. The caution to the beginner in ordered reflection is that it should not be taken too soon without as careful an application of deduction⁹ and as complete inductive search for new evidence as time, funds, patience, and ability make possible. His work will become, from one point of view, more "scientific" the longer he refuses to formulate the next theory or inference and the more points of application with past ex-

⁷ F. L. Whitney, "The Science-Philosophy Thought Process," *Teachers Journal and Abstract*, 6: 494, 1931; W. H. Kilpatrick, "The Relation of Philosophy to Scientific Research," *Journal of Educational Research*, 24: 97-114, 1931.

⁸ John Dewey, "The Determination of Ultimate Values or Aims through Antecedent or a Priori Speculation or through Pragmatic or Empirical Inquiry," Chapter XXVIII in F. N. Freeman, *et al.*, *The Scientific Movement in Education*. Chicago: National Society for the Study of Education, 1938, Yearbook XXXVII, Part II, pp. 473, 474.

⁹ R. T. Bye, "The Inductive Testing of an Economic Deduction: A Method Illustrated by Analysis of Marginal Producers and Representative Firms," in S. A. Rice, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, pp. 615-634.

perience he discovers. Ichabod Crane was no scientist. The gullibility of his naïveté was equaled only by his mental swallow!

It will be recognized also that on every level of generalization the normal mind may go through one and perhaps several rather complete acts of reflective thought. There is first of all (a) a feeling of deficiency or need, then (b) a more or less definite delimitation of the problem situation involved, followed by (c) the acceptance of a tentative conclusion, (d) its critical examination in terms of evidence, and (e) its experimental corroboration or rejection. If it is abandoned as unsatisfactory, another cycle of the thought act is inaugurated, and so on.

A caution to the beginner is to the effect that the process of thinking illustrated in Figure 1 and characterized above cannot be thought of as invariably a definite time sequence, such as that suggested from (a) to (e) in the preceding paragraph, for example. The mind acts not only as a unit, but without much regard for a logically conceived series of things done in the act of reflective thinking. There is a continuous shuttlelike rhythm of induction and of deductive verification, proceeding from lower levels to higher and higher generalizations.¹⁰ This is often very quick, but at times it may cover years of ordered thinking.

To illustrate very roughly the growth of a generalization: There was a time when you had never seen an orange. When the first orange appeared, if you could talk, you could say only, as a result of this single experience, "This orange is yellow." If you next see two, you can say, "Two oranges are yellow." If experience next presents a bushel, the reaction may be, "A bushel of oranges are yellow"; and this is a much larger generalization than the first conclusion about one. Thus the concept may grow, until now you may believe that you know the ultimate truth about it, and that *all oranges are yellow*. But some plant wizard may develop a blue orange. Then the contour of all previous beliefs must be fitted to new evidence. This analogy falls down, when the higher realms of thought are reached, unless absolute values are injected into the orange concept! But it illustrates roughly the growth of an idea from the first isolated item of bare experience to conclusions of rather inclusive generality. For an outstanding example of ordered thinking, see Volumes III and IV of a publication in the field of science, *The Science of Life*.¹¹

Many concrete and detailed illustrations of actual thinking in the

¹⁰ Laurence Buermeier, *et al.*, Columbia Associates in Philosophy, *An Introduction to Reflective Thinking*. Boston: Houghton Mifflin Company, 1923.

¹¹ H. G. Wells, J. S. Huxley, and G. P. Wells, *The Science of Life*. New York: Doubleday, Doran and Company, 1931, Vols. III, IV, pp. 773-1514.

conception and carrying through of research projects will be found in succeeding chapters. One analysis of reflection in everyday experience is given here. This is furnished by a beginning graduate student, preparing to set up a specific thesis project in progress toward a higher degree. To this is added the method used by a successful modern historian in reflective thinking among the problems found in his field of activity. Criticize both in terms of the six steps in reflective thinking suggested by Dewey and Kelley.

1. INFORMAL REASONING

a. A Felt Need.

An individual faces the fact that very soon in life he will be dependent upon his own resources in earning a livelihood. The question arises: Would it be better to spend time, money, and energy in preparation for a desirable position in some profession, or to take employment available at the present time without further training or education?

b. The Problem.

What is the status in life of educated professional people, as compared to those with no special preparation?

c. The Hypothesis.

From observation, it would seem that skilled and professional people have a decided advantage over those with no special preparation. Their standard of living is higher. Their understanding and appreciation of the finer things in life are greater. Their associates are of a more desirable class of people, and so on.

d. Collection of Data as Evidence.

(1) Make a study of the standards of living of the unskilled, skilled, and professional classes.

(2) Study the intelligence of each class by various tests and measurements.

(3) Study types of recreational and leisure time activities.

(4) Determine the needs of society in the various kinds of occupations and professions.

(5) Determine the amount of money necessary for professional preparation, and the remuneration that can be expected.

e. Concluding Belief.

Through the study of the evidence available, it would be logical to conclude that the professional class of people are superior in their life status, as compared to the skilled and unskilled groups.

f. The General Value of the Conclusion.

Because of the modern method of living with its machines to replace hard labor, its speeded transportation facilities, newer and quicker ways of communication through radio, short wave, and the like, it seems probable that in the near future labor will not be so universally necessary to provide even the

most common necessities of life that are now demanded of it. For this reason, it is probable that the desirable criterion will for some time be a place among professional workers.

2. CAREFULLY ORGANIZED REFLECTION

James Truslow Adams, the well-known author of *The Epic of America*,¹² describes minutely his mind processes in writing history.

a. Mr. Adams is motivated from the wealth of his background of family and personal experience, as well as by much vicarious contact (research) in American history.

b. This constant urge challenges him to attack problem after problem which becomes feasible in terms of his personal location and the availability of material. For example, the problem of the *Epic* was not that of the minute tracing of events and movements. It was rather the more difficult task of writing an outline of American history with the emphasis upon interpretation. He tries to "... make a pattern of any period of history," in the light of an eclectic attitude toward theories of cause and effect.

c. His work on the solution of the problem is from a definite but not a narrow point of view. "... From a philosophical standpoint, take a longer stretch and try to follow some thread of influence through the whole; in other words try the experiment of making a hypothesis." Such tentative generalizations as the following are used—the economic theory, the great-man theory, the influence of social forces, of religion, money, pride, ambition, love of adventure, intellectual curiosity, sexual love, hate, and so on.

d. In elaborating tentative philosophies considered as elements in a solution of the problem under inquiry, his method is to "... amass facts from analytical research and arrange them on some sort of conventional string." He develops the implications of items of evidence found.

e. A corroboration of ideas analyzed is arrived at with an experimental attitude of mind and in terms of faithful reporting of actual tryouts in the past experience of individuals and groups that have featured in American history.

f. Finally, there is broad-minded evaluation of conclusions reached, in terms of their permanency in time and place. His method is to "... interpret facts, to try to find out how they are related and how they influence one another." In fact, there is a continuous process of reflective thinking in the area of historical facts and values considered.

B. The Method of Science

✓ If a dictionary is examined for a definition, it is usually found that science is characterized as *organized knowledge*. But science is a

¹² J. T. Adams, *The Epic of America*. Boston: Little, Brown and Company, 1931, and "My Methods as a Historian," *The Saturday Review of Literature*, 10: 777, 778, 1934.

process also,¹³ and it is the *method* of science that is of supreme importance. The reason for this is obvious. The knowledge, the conclusion, the facts of science are seldom final truth. New experience, additional data as evidence, constantly change them. The "facts" of yesterday are outmoded today. They are replaced by generalizations that conform to the latest bodies of findings. Illustrations of this are so well known that they need not be given in detail here. In the realm of social science, note how conceptions of and attitudes toward strangers of other countries and races constantly change with more detailed and intimate personal acquaintance. The barbarian of a generation ago is now my neighbor and friend, and may become a member of my family. In physical science, such basic concepts as space, time, and distance are constantly appearing with new connotations.

How does the scientist work? What are his methods? Many statements and analyses of practice are available. Milton Fairchild¹⁴ of the Character Education Institution lists six steps in the scientific process.

1. *Gather data* on the problem or within a selected field according to some adequate, sound plan by means of numerous and accurate observations made with the human senses, assisted and corrected by instruments of precision. The observations are usually with a well-defined purpose but sometimes for information according to opportunity. Observations must be recorded in definite terms and measurements and in specific statements. Many observers may collaborate in gathering data.

2. *Classify and organize data* on the basis of similarities, variations, activities, processes, causes, results. Distinguish between essential and superficial characters.

3. *Generalize* to get principles and theories into tentative form. Use constructive imagination, discernment, known principles to formulate reasonable generalizations that solve the problem or explain the known facts in the selected field. Many researchers accept a mass of classified data and verified generalizations and then proceed to solve some problem by formulating hypotheses thereon and verifying these, without including general gathering of data and classification work.

4. *Verify generalizations* by controlled experiments, by tested predictions of results, by repetition of experiments and the gathering of additional data. Appraise data by coefficients of variation and of correlation, and by probable error. Determine sources of error in method and apparatus, and evaluate by auxiliary investigations. State all assumptions and include them in the conclusions.

¹³ L. T. Hogben, *Science for the Citizen*. New York: Alfred A. Knopf, 1938, pp. 735, 736.

¹⁴ Milton Fairchild, *The Scientific Method*. Washington, D. C.: Character Education Institution, National Capital Press, 1926.

5. *Report the research* in full and subject results to criticism and verification by others competent to collaborate.

6. *Announce the results* of the research to the general public for practical use.

An authoritative statement of method in natural science is given by E. R. Downing¹⁵ of the University of Chicago, who analyzes the scientific process into seven "elements" and sixteen "safeguards."

Elements of Scientific

Thinking

a. Purposeful observation.

b. Analysis—synthesis.

c. Selective recall.

d. Hypotheses.

e. Verification by inference and experiment.

f. Reasoning by:

(1) Method of agreement.

(2) Method of differences.

(3) Method of residues.

(4) Method of concomitant variation.

(5) Joint method of agreement and difference.

g. Judgment.

Safeguards

(1) Must be accurate.

(2) Must be extensive.

(3) Must be done under a variety of conditions.

(4) The essential elements in a problematic situation must be picked out.

(5) Dissimilarities as well as similarities must be regarded. Danger of analogy.

(6) Exceptions are to be given special attention. Selective interpretation.

(7) A wide range of experience is necessary.

(8) All possible hypotheses must be considered. Fertility of suggestion.

(9) Inferences must be tested experimentally.

(10) Only one variable is permitted.

(11) Data must be cogently arranged.

(12) Judgment must be passed on the adequacy of the data.

(13) Judgment must be passed on the pertinency of data.

(14) Must be unprejudiced.

(15) Must be impersonal.

(16) Must be suspended, if data are inadequate.

¹⁵ E. R. Downing, "The Elements and Safeguards of Scientific Thinking," *Scientific Monthly*, 26: 231, 232, 1928; "Some Results of a Test of Scientific Thinking," *Science Education*, 20: 122 ff, 1936; *An Introduction to the Teaching of Science*. Chicago: University of Chicago Press, 1934, pp. 52-88; and "Does Science Teach Scientific Thinking?" *Science Education*, 17: 87-89, 1933.

Charles Darwin gives a sketch of his scientific method in the form of a brief autobiography, written for his family. In Chapter II of Volume I of his *Letters*, he characterizes his method in the discovery of the law of natural selection as follows:

By collecting all facts which bore in any way on the variation of animals and plants under domestication and nature, some light might perhaps be thrown on the whole subject. My first note-book was opened in July, 1837. I worked on true Baconian principles, and, without any theory, collected facts on a wholesale scale, more especially with respect to domesticated productions, by printed enquiries, by conversation with skilful breeders and gardeners, and by extensive reading. When I see the list of books of all kinds which I read and abstracted, including whole series of Journals and Transactions, I am surprised at my own industry. I soon perceived that selection was the key-stone of man's success in making useful races of animals and plants. But how selection could be applied to organisms living in a state of nature remained for some time a mystery to me.¹⁶

Darwin calls his method "systematic inquiry operating on true Baconian principles." If the above statement is compared with the analysis of the act of thought given in Section A, it will be seen that steps "b" and "c" are at first markedly subordinated and even delayed until after a thorough and detailed grasp is obtained of all available data in the field of inquiry that has been examined. This is the method of Bacon, so severely criticized by Florian Cajori¹⁷ of the University of California, and others. With a mind less intelligent, below the level of genius, such a prolonged refusal to concentrate reflection in a specific direction indicated by the most likely hypothesis would be fatal. Darwin himself speaks of it as like the aimless counting of pebbles in a quarry. But after four or five years, thinking was more definitely focused on one hypothesis, that natural selection was the solution of the problem of the origin of species. "Here, then, I had at last got a theory by which to work; but I was so anxious to avoid prejudice that I determined not for some time [actually nineteen years] to write even the briefest sketch of it."

The completeness and logical continuity of the act of reflective thought are indicated in Figure 1. Reasoning appears on all levels, using generalizations of all values from the smallest specifics of early experience to the world-wide concepts of philosophy. The little five-

¹⁶ Francis Darwin, *The Life and Letters of Charles Darwin*, "Autobiography," Vol. I, Chapter II. New York: D. Appleton-Century Company, 1899, Vol. I, Chap. II.

¹⁷ Florian Cajori, "Baconian Method of Scientific Research," *Scientific Monthly*, 20: 85-91, 1925.

year-old who, when asked if Auntie gave him a big jackknife which he had in his hand, replied, "Oh, no, John (the chauffeur) gave it to me. He understands little boys," was employing the same *method* of cogitation as his philosopher grandfather, the questioner, although the concepts used were widely different in value. Philosophy, as has been said, uses the facts of science as raw material in a process of induction and deductive tryout identical with that which science itself employs in the development of its theories and laws.¹⁸

If the above is true, any controversy that may arise between actual scientific method and true philosophic thought is without foundation. All that is necessary is an agreement on logical definition of the concepts *science* and *philosophy* as acts of thought. F. N. Freeman of the University of California analyzes the interrelationships of the two concepts in the 1938 yearbook of the National Society for the Study of Education.¹⁹ H. G. Hullfish of Ohio State University argues for the essential unity of science and philosophy in that one discovers *what* is life as *knowledge*, but philosophy "views knowledge in its relation to *conduct*." Science gives the thinker the facts, but "the setting of a program is a philosophical problem," because the first step is a decision on large generalizations as ultimate objectives. One illustration here is in psychology. The *fact* is that the child reacts to satisfactions, but this does not tell the teacher what to do. He must set up in his consciousness the final aim of some kind of good life, and then he can organize his curriculum in terms of certain satisfactions to be desired and certain others to be avoided.

Further, the thesis is that education now has an opportunity and is obligated to make an alliance in actuality between science and philosophy.

We know in some considerable detail now, for instance, the duties that high-school teachers are called upon to perform. This is information of the highest value. But on this score, as on all others, the mere presence of facts, no matter in what quantity, does not provide us with an educational program. These facts, in themselves, do not answer the question, "What duties *should* the high-school teacher perform?" To this question science, except insofar as it frankly turns philosopher, can provide no answer. We know that behavior is shot through and through with habit. It is of paramount

¹⁸ H. W. Holmes, "The Philosophic Element in Scientific Method," *School and Society*, 41: 41 ff, 1935; and *Educational Research: Its Nature, Essential Conditions, and Controlling Concepts*, Series I, 3, 10. Washington, D. C.: American Council on Education, 1939.

¹⁹ F. N. Freeman, *et al.*, *The Scientific Movement in Education*. Chicago: National Society for the Study of Education, 1938, Yearbook XXXVII, Part II, pp. 488-495.

importance to know this, but, as knowledge, it does not tell us whether or not education should set its methods so that habit becomes the master of the individual or for the purpose of making the individual the master of habit. We know, too, that certain dates and events of historical importance occur more frequently than others in social intercourse, spoken and written. This fact, however, does not tell us what history to teach. We must again have recourse to our fundamental purpose. We are being told at the moment that students on the college level learn as much (and with equal or superior proficiency) in large classes as in small classes. Information of this sort is of value in the event that there is but one purpose of a college education, to absorb information. Change the purpose and the evidence slate is blank again.²⁰

It is probable that Kelley has approached a true explanation of apparent discrepancies in what constitutes scientific and what philosophic reflection. He continues the analysis of the complex act of thought given in Section A to include eight steps as follows:

PROCEDURES IN A COMPLETE ACT OF THINKING

1. A felt difficulty.
2. A definition of the difficulty.
3. A tentative solution.
4. A mental elaboration of the solution, leading to
 - a. Additional tentative solutions and elaborations, if felt necessary, finally leading to
5. The belief that the solution is all right.
6. An experimental verification.
7. An appraisal of the experimental findings leading to acceptance of mental solution and a decision for immediate conduct, or to rejection and a reinstatement of a felt difficulty. The process is continued until a verified solution which is immediately serviceable is obtained.
8. A forward look, or mental picturing of future situations to which the present solution is pertinent.

The first five steps are common to philosophy and science, but the sixth step, experimental verification, requires appreciable time not available to one who must act. Science continues and carries through the complete act of thought; philosophy does not. The distinction here made is reflected in the difference in activity of acknowledged scientists and philosophers. A distinction which I have occasionally heard calling the thinking part of the scientist's endeavors philosophic and the measurement and manipulative aspects scientific is a distinction that would not occur to or appeal to a scientist, as it would chop him up into unrecognizable parts. There are three important consequences of the difference noted. The philosophic solution is more likely timely no matter how urgent the problem; the philosophic

²⁰ H. G. Hullfish, "The Relation of Philosophy and Science in Education," *Journal of Educational Research*, 20: 159-165, 1929.

solution is more likely to be wrong than the scientific; and third, the philosophic forward look should be one of misgiving and largely a query.²¹

W. H. Kilpatrick of Teachers College, Columbia University, an exponent of Dewey's philosophy, has the following rejoinder:

It ought to be said, however, in this connection, that the philosophic procedure will scrutinize very closely all alleged facts. It will be very sensitive to discover any possible biases or unexamined presuppositions that may be involved in the finding or statement of such facts. All probable presuppositions and all *obiter dicta* given out in connection with the publication of fact findings will be especially scrutinized to see whether some bad philosophy may not be masquerading under the name of science. As any and all science whatsoever stands upon philosophic assumptions of one kind or another, the need for this precaution becomes the more necessary. In a word, all good philosophizing takes its facts from the best available scientific authority, but only after the closest scrutiny. And good philosophy does not hastily conclude that all the evidence is assembled. It knows too well the history of thought to fall easily into this error.²²

The place of philosophy in one field of social thinking, that of public school education, is indicated above by Hullfish. Another pertinent question is advanced, "Is education a science?" Some natural scientists assert that the scientific method is impossible in the field of the social studies: economics, sociology, education, history, and the others. The extremely opposite view is held by such an educator as W. C. Trow²³ of the University of Michigan, and such a sociologist as G. A. Lundberg²⁴ of the University of Pittsburgh. They assert that education has already arrived as a science. For a debate on this see two related journal articles.²⁵ S. A. Courtis of the University of Michigan adopts a middle-of-the-road attitude, pointing out that education on the whole is now at the stage of "biased observation and uncritical acceptance of assumptions." This is found in a conception of four milestones in the historical development of the scientific method.

²¹ T. L. Kelley, "The Scientific Versus the Philosophic Approach to the Novel Problem," *Science*, 71: 299, 1930.

²² W. H. Kilpatrick, "The Relation of Philosophy to Scientific Research," *Journal of Educational Research*, 24: 97-114, 1931.

²³ W. C. Trow, *Scientific Method in Education*. Boston: Houghton Mifflin Company, 1925.

²⁴ G. A. Lundberg, *Social Research: A Study of Methods of Gathering Data*. New York: Longmans, Green and Company, 1929.

²⁵ F. S. Breed, "Is a Science of Education Possible?" *Scientific Monthly*, 39: 530-535, 1934; Nathaniel Peffer, "Educators Groping for the Stars," *Harper's Magazine*, 168: 230-238, 1934.

1. Common-sense observation.
2. Biased observation and uncritical acceptance of assumptions.
3. Careful analytical search of pertinent experience.
4. True science based on exact knowledge applied in service of the common good.²⁶

One of the recent analyses of the significance of the scientific movement in education suggests that a pause should be made, after forty years of sincere endeavor to make education scientific in method and in outcomes, to consolidate findings and weigh important values that have appeared. It may be that educational science has "gone about as far as it can in improving education. For further advance, it may be asserted, we must turn to an essentially different inquiry, the discovery or rediscovery of the basic values that underlie education. This is to be made by independent and self-sustaining thought or reflection. Science has shot its bolt. It remains for philosophy to take the field."²⁷ Indication of this attitude, among educational leaders, is found in the implementation project of the American Council on Education in the field of teacher education.²⁸ This is essentially an attempt to analyze and synthesize generalizations in order to establish desirable philosophical values.

May not the answer to the query, "Is education a science?" be that evidence of more and more true reflection is being found in educational reports and educational practice, that education is becoming *scientific*, that we are slowly getting science *in* education, but that there is not as yet a true science of education? This view seems to be indicated in the title of the yearbook of the National Society for the Study of Education just cited, *The Scientific Movement in Education*.²⁹ Every earnest educational research worker should study the details of this report of the generation-old attempt to make American education scientific.

After all, in both realms of thought, may it not be essentially just

²⁶ S. A. Courtis, "Education—A Pseudo-Science," *Journal of Educational Research*, 17: 130-132, 1928.

²⁷ F. N. Freeman, *et al.*, *The Scientific Movement in Education*. Chicago: National Society for the Study of Education, 1938, Yearbook XXXVII, Part II, p. 488.

²⁸ Karl Bigelow, "Emphasis on Cooperation," *Educational Record*, 20: 188 ff, 1940.

²⁹ B. R. Buckingham, "Educational Research in Perspective," *School and Society*, 47: 466 ff, 1938; John Dewey, "The Relation of Science and Philosophy as the Basis of Education," *School and Society*, 47: 470 ff, 1938; F. N. Freeman, "Introducing the Yearbook," *School and Society*, 47: 457 ff, 1938; Paul Monroe, "The Scientific Movement in Education in Foreign Countries," *School and Society*, 47: 461 ff, 1938.

a matter of degree? Very probably it may be said that no final truth has yet been found in either the field of physical entities or in that of social relationships. If all reports of methods and results in all human inquiry could be placed on a scale of values from *no reflection and no value* to *completely careful thinking and good value*, no doubt one would find at the left illustrations of social studies grouped from the zero point toward some midpoint on the scale, and physical science inquiries placed near to the extreme right-hand point of ultimate truth, but extending to the left to overlap social science findings. It is suggested that the student try such a rough measurement on a scale of reflective thinking, using, for example, accounts like that of Rice and Lenard.⁸⁰

Finally, a careful analysis by our leading educational philosopher⁸¹ sets forth the viewpoint that educational science finds its sources in the human and the physical sciences first of all, educational practices furnishing the problems that must be solved.

Dewey distinguishes between the *sources* and the *content* of science in education. Scientific results, according to his viewpoint, are not educational science. These results must be first used by the educator to make educational practices more intelligent. Then an educational science develops parallel to education as an art.

"The net conclusion of our discussion is that the final reality of educational science is not found in books, nor in experimental laboratories, nor in the classrooms where it is taught, but in the minds of those engaged in directing educational activities. Results may be scientific short of their operative presence in the attitudes and habits of observation, judgment, and planning of those engaged in the educative act. But they are not *educational science* short of this point. They are psychology, sociology, statistics, or whatever."

It is held, too, that the problems of educational science are found among educational practices, not in the basic sciences themselves, and that educational practices themselves are "final test of value of the conclusion of all researches." Scientific results are not scientific in the field of education until they are used in actual practice. The procedure: (a) Practice sets the problems; (b) science solves them; (c) practice checks up and evaluates.

The author concludes, then, that education cannot be an independent science. . . . "Educational practices furnish the material that sets the problems of such a science, while sciences already developed to a fair state of maturity are the sources from which material is derived to deal intellectually with these problems. There is no more a special independent science

⁸⁰ S. A. Rice, *Methods in Social Science*. Chicago: University of Chicago Press, 1931; Philipp Lenard, *Great Men of Science: A History of Scientific Progress*. New York: The Macmillan Company, 1933.

⁸¹ John Dewey, *The Sources of a Science of Education*. New York: Live-right Publishing Corporation, 1920.

of education than there is of bridge making. But material drawn from *other* sciences furnishes the content of educational science when it is focused on the problems that arise in education. . . ."

The writer cannot see why a broad conception of all reflective thinking including all scientific inquiry would single out one corner of the field, where the educational situation is found, to be subordinate to others. When a feeling of need arises in any human activity, in the schoolroom, in the bank, on the farm, in building a bridge, the normal mind after defining the problem and accepting tentatively the most logical inference reaches out and uses any methods and tools available anywhere in order to collect further evidence. At this point in the thinking process, an inclusive unity must be assumed to cover all scientific processes and procedures. And it cannot be concluded that any realm of thought, with its tools of precision and tried methods of inquiry, is necessarily ancillary to any other.

The new science of education, for example, is beginning to develop certain processes of inquiry which are as useful in the other human studies and even in the physical sciences as within its own peculiar field. It is not to be concluded, without danger of denial, that in the big storehouse of materials now available for problem solving after ages of human activity there are more or less independent departments set off for the exclusive use of groups having peculiar objectives. The experience of the race is open to all, and in any business, profession, or art use may be made of anything which will advance human thought at that point of inquiry. Because the social sciences, including education, are coming last of all upon the scene of action is no reason for denying them equal privileges. They should be given the benefit of any doubt found in the mind of any science student. When they have been operative longer, they will themselves furnish more frequently the "sources" for other sciences.³²

An inevitable conclusion seems to be that, in a successful educational program, the science-philosophy method should use these two inseparably concomitant activities. Both are necessarily parts of one unitary thought process. Modern educational champions, like the knights of old, will only endanger the welfare of all concerned by loudly maintaining that the shield is either all gold or all silver. An eclectic point of view is sadly needed, so that education may have something effective done about social values.³³ Otherwise, the process can only be a continuation of the age-old activity of busy progress toward a goal—the direction of which has never been definitely determined.

³² F. L. Whitney, "The Sources and the Content of a Science of Education," Editorial, *Teachers Journal and Abstract*, 5: 56-58, 1930.

³³ R. S. Lynd, *Knowledge for What? The Place of Social Science in American Culture*. Princeton, N. J.: Princeton University Press, 1939, Chap. V.

C. The Meaning of Research

It has been seen that reflective thinking and science are two very similar activities. In fact, the thinking method of reputable scientists is in terms of a complete act of carefully organized reflection. Good science is motivated by a general feeling tone of desire to advance the frontiers of human knowledge. The specific process of ordered reasoning comes out of the recognized need to clear up a status of doubt and uncertainty, caused by a feeling that a blind alley or a blocked path confronts human experience. Scientific curiosity soon isolates and limits the problem dominating this cloudlike condition, and eventually makes the best guess for a solution in the light of all previous research, both personal and vicarious, in the specific field involved. Pseudo-philosophy closes the process and acts at this point, but true philosophical thought delays and continues, as does science, to examine the value of the hypothesis tentatively adopted in terms of adequate comparison or controlled experimentation. If all evidence obtainable points toward the value of this solution, it is adopted as present truth. However, true science still keeps an open mind and begins at once to test the generalization obtained prognostically, in terms of its probable place and time value.

Thus ordered thinking is the method of true science. The scientific method is the method of reflective thought. But what is research? As in the case of the concepts, thinking and science, many attempts have been made to characterize research. However, this has been very often in terms of set definitions instead of attempts to analyze the steps in the process.

As a general background, two definitions will be given first from successful industry. The chairman of General Motors says, "Scientific management means a constant search for the facts, the true actualities, and their unprejudiced analysis. I keep saying to the organization that we are prepared to spend any proper amount of money to get the facts. Only by increased knowledge can we progress—perhaps I had better say 'survive.' That is really research, but few realize that research can and should be just as effectively used in all functional branches of industry as in physics. Research into the problem of distribution, for instance, has paid General Motors big dividends. Again it is the scientific approach. I keep mentioning it because it seems to me that the willingness and ability to apply such methods might well determine the extent of success of any enterprise, and the larger the enterprise the more vital it becomes."³⁴

³⁴ A. P. Sloan, Jr., "Adventures of a White-Collar Man," *Saturday Evening Post*, 213: 62, 1940.

Again from General Motors, the point of view of their leading research man is, "Research is a high-hat word that scares a lot of people. It needn't. It is rather simple. Essentially, it is nothing but a state of mind—a friendly, welcoming attitude toward change. Going out to look for change, instead of waiting for it to come. Research, for practical men, is an effort to do things better and not to be caught asleep at the switch. The research state of mind can apply to anything. Personal affairs or any kind of business, big or little. It is the problem-solving mind as contrasted with the let-well-enough-alone mind. It is the composer mind, instead of the fiddler mind; it is the 'tomorrow' mind, instead of the 'yesterday' mind."³⁵

Two educational leaders characterize creditable research in higher education and in the public school situation. R. M. Hutchins, chancellor of the University of Chicago, says, "Research in the sense of gathering data for the sake of gathering them has no place in a university. . . . Research in the sense of the development, elaboration, and refinement of principles, together with the collection and use of empirical materials to aid in these processes, is one of the highest activities of a university and one in which all its professors should be engaged."³⁶

Clifford Woody of the University of Michigan writes:

Research is a "careful ~~of~~ critical inquiry or examination in seeking facts or principles; a diligent investigation to ascertain something," according to *Webster's New International Dictionary*. This definition makes clear the fact that research is not merely a search for truth, but a prolonged, intensive, purposeful search. In the last analysis, research per se constitutes a method for the discovery of truth which is really a method of critical thinking. It comprises defining and redefining problems; formulating hypotheses or suggested solutions; collecting, organizing, and evaluating data; making deductions and reaching conclusions; and, at last, carefully testing the conclusions to determine whether they fit the formulating hypotheses."³⁷

In 1929, the following rather carefully stated definitions of educational research were submitted to the group of educators found in the thirty-seven Phi Delta Kappa chapters.

1. Research is an honest, exhaustive, intelligent searching for facts and their meanings or implications with reference to a given problem. The

³⁵ C. F. Kettering, "More Music Please, Composers!" *Saturday Evening Post*, 211: 32, 1938.

³⁶ R. M. Hutchins, *The Higher Learning in America*. New Haven: Yale University Press, 1936.

³⁷ Clifford Woody, "The Values of Educational Research to the Classroom Teacher," *Journal of Educational Research*, 16: 172-178, 1927.

product, or findings, of a given piece of research should be an authentic verifiable contribution to knowledge in the field studied. There are two distinct types of research: basic or fundamental or constructive research and service research. The former is fundamental to the development of a science of education; the latter is less far-reaching in its scope and is usually pursued as a means of solving immediate local problems. *P. M. Cook, Phi Delta Kappa Fraternity.*

2. Research is simply a systematic and refined technique of thinking, employing specialized tools, instruments, and procedures in order to obtain a more adequate solution of a problem than would be possible under ordinary means. It starts with a problem, collects data or facts, analyzes these critically, and reaches decisions based on the actual evidence. It involves original work instead of mere exercise of personal opinion. It evolves from a genuine desire to know rather than a desire to prove something. It is quantitative, seeking to know not only what but how much, and measurement is therefore a central feature of it. *C. C. Crawford, University of Southern California.*

3. Research may be defined as a method of studying problems whose solutions are to be derived partly or wholly from facts. The facts dealt with in research may be statements of opinion, historical facts, those contained in records and reports, the results of tests, answers to questionnaires, experimental data of any sort, and so forth. The final purpose of educational research is to ascertain principles and develop procedures for use in the field of education; therefore it should conclude by formulating principles or procedures. The mere collection and tabulation of facts is not research, though it may be preliminary to it or even a part thereof. *W. S. Monroe, University of Illinois.*

4. Educational research aims to make contributions toward the solution of problems in the field of education by the use of the scientific-philosophical method, the method of critical reflective thinking. On the level of science, this operates in terms of specifics of experience which are organized and evaluated and which result in hypotheses and theories each successively subjected to deductive testing. The method of philosophy uses the conclusions of science as raw material and, largely by subjective processes, arrives at larger and larger generalizations constantly approaching truth in the field investigated. *F. L. Whitney, Colorado State College of Education.*

The Phi Delta Kappa chapters were asked to select their preference among these definitions or to prepare a substitute. No other statement was offered, six chapters selected definition 1 as their conception of what educational research means, seven selected statement 2, seven selected statement 3, three selected statement 4, ten did not respond, and two chapters reported that the concept *research* cannot be defined. The report of the committee conducting the inquiry closes with this comment:

However, the committee believes that it would be creditable if, for example, the chapters could come to some agreement on the concept, *educa-*

tional research. Such action would be a contribution to the solution of a vital problem in the field of education, the establishment of a terminology having definite content meaning. The lack of consensus of judgment among educational research men on units of thought and of measurement in their work is one of the retarding influences which slows up the progress of educational research from levels of tradition and guess to the use of accepted methods of reflective thought in science and philosophy.³⁸

P. M. Cook, Executive Secretary, reports that a specific definition of *research* or *educational research* has never been endorsed by Phi Delta Kappa other than that in the *Dictionary of Education*.³⁹ The definition of research there is "ideally, the careful, unbiased investigation of a problem, based insofar as possible upon demonstrable facts and involving refined distinctions, interpretation, and usually some generalization." (The definition of educational research is, "study and investigation in the field of education or bearing upon educational problems.") However, the constitution of the fraternity, found in the *Phi Delta Kappa Directory* (1931), characterizing the three ideals of the organization—service, leadership, and research—comments, ". . . *research* both in and out of the universities, so that problems may be understood and difficulties scientifically solved." Further, the 1929 issues of the *Phi Delta Kappan* include a symposium on research, in which nine members attempt definition. Considering the statement quoted from the 1929 report, one would have expected the fraternity to agree soon on the meaning of this concept, which covers at least a third of its threefold objective.

Finally, a functional definition of educational research by W. S. Monroe and M. D. Engelhart of the University of Illinois emphasizes the whole purpose of the process of reflective thought, as resulting in effective action on the basis of the generalization discovered.

Educational research is the name for a type of procedure employed in answering thought questions about education; that is, questions for which answers must be manufactured by reflective thinking. This procedure is one in which the best data obtainable are used and the thinking is critical. At times a research worker may be concerned with fact questions answerable by routine clerical activities. If the answers to such questions are needed as a means of dealing with thought questions, such activities are a phase of educational research.

The ultimate purpose of all educational research is the discovery of procedures, rules, and principles relating to the various aspects of education.

³⁸ F. L. Whitney, *et al.*, "Initiation Practices of Phi Delta Kappa," *Phi Delta Kappan*, 12: 122-126, 1929.

³⁹ C. V. Good, *Dictionary of Education*. New York: McGraw-Hill Book Company, 1945, p. 346.

Or to express it in a somewhat different way, the function of educational research is to determine what we should do or attempt to do in educating children and adults. However, many of the activities of research workers have as their immediate purpose the determination of what is, or what has been, rather than what should be. This is not inappropriate, provided the securing of this information is looked upon as a means for determining what should be.⁴⁰

But, as in the case of the act of reflection itself and in thinking in the field of natural science, the research process has been analyzed by a number of educators. W. C. Schluter of the University of Pennsylvania conceives of fifteen steps as characterizing creditable research.

1. Selecting the field, topic, or subject for research.
2. Surveying the field to apprehend the research problem.
3. Developing a bibliography.
4. Formulating or defining the problem.
5. Differentiating and outlining the elements in the problem.
6. Classifying the elements in the problem according to their relation (direct or indirect) to the data or evidence.
7. Determining the data or evidence required on the basis of the elements in the problem.
8. Ascertaining the availability of the data or evidence required.
9. Testing the solvability of the problem.
10. Collecting the data and information.
11. Systematizing and arranging the data preparatory to their analysis.
12. Analyzing and interpreting the data and evidence.
13. Arranging the data for presentation.
14. Selecting and using citations, references, and footnotes.
15. Developing the form and style of the research exposition.⁴¹

If these fifteen things to be done in research are compared with the six steps in scientific reflective thinking listed in Section A, one finds all of the activities there analyzed in more detail for each, except that the presence of a felt need and the definite tentative acceptance of a hypothetical solution of the problem are assumed. No doubt the last step of prognostic prediction is included in item 12.

H. H. Abelson,⁴² of the College of the City of New York, conceives of the whole problem of research as outlined below; and one finds here the essentials of the method of science and reflective thinking.

⁴⁰ W. S. Monroe and M. D. Engelhart, *The Techniques of Educational Research*. Bulletin No 38. Urbana, Ill.: University of Illinois Press, 1928, p. 70.

⁴¹ W. C. Schluter, *How to Do Research*. New York: Prentice-Hall, Inc., 1926, p. 5.

⁴² H. H. Abelson, *The Art of Educational Research*. Yonkers: World Book Company, 1933, pp. 33, 34.

1. *Title*—Indicate the title in precise terms.
2. *Selection of the problem.*
 - a. *Source*—Indicate what suggested the topic to you.
 - b. *Justification*—Justify the selection of the problem by listing reasons with respect to its personal suitability and its general value.
 - c. *Scope*—Indicate the proposed scope of the study by stating briefly the kind or kinds of persons, situations, materials, and the like to which the study is to apply.
3. *Procedure of solution.*
 - a. *Logical analysis*—Give in systematic and in logically related arrangement the issues, elements, or subtopics into which the problem may be divided.
 - b. *Research procedure*—Describe briefly in related fashion the research procedures to be used in attacking the several elements of the problem.
 - c. *Data needed*—List the specific data, facts, or information to be obtained.
 - d. *Procurement of data*—Show how each set of data is to be procured, including reference to the means by which personal contacts are to be made.
 - e. *Treatment of data*—Show how the data are to be treated to be made meaningful as applied to the solution of the problem.
 - f. *Assumptions made*—List the assumptions or things taken for granted with respect to the several phases of the procedure employed in studying the problem.
4. *Conclusions.*
 - a. *Hypothetical conclusions*—Indicate two or three of the conclusions or kinds of results that might grow out of the study.
 - b. *Implications of conclusions*—Indicate some of the implications of the hypothetical results listed; that is, give several inferences bearing on the problem or its probable applications.
5. *Previous studies*—Briefly summarize the previous related work done and list bibliographic references to research in the field or to related studies which might serve as models for the solution of the problem at hand.

C. C. Crawford of the University of Southern California lists nine characteristics of research, and one finds that he has in mind the method of reflective thinking and science.

1. It centers around a problem.
2. It involves original work.
3. It rests upon a mental attitude of curiosity.
4. It requires an open mind.
5. It rests on the assumption that everything is subject to law and order.
6. Its object is to discover laws and generalizations.

7. It is a study of cause and effect.
8. It is based on measurement.
9. It involves a conscious technique.⁴³

Other rather complete analyses of research procedures might be cited. All of them would envisage, to more or less degree, methods of reflective thinking in scientific investigation. Probably none of them would be as authoritative as E. R. Downing's⁴⁴ catalogue of elements and safeguards in natural science thinking given above. In Chapter V, a suggested list of logical procedures in a research study will be discussed. These have come out of many years of personal and vicarious experience in educational research.

In a search for the meaning and the steps of method in scientific research, the question of its objective is pertinent. Here two types are usually considered: pure research and practical or applied, research. An analysis of their characteristics will aid in getting a true conception of creditable research.

Pure research is not hampered by considerations of the social use to which discoveries may be put. It is interested first of all in the continuity and integrity of the thought process in science and philosophy. It is willing to let this proceed in any likely direction without regard to what contact is made, if any, with things as they are in society. It permits the thinking process to lead where it will, no matter what erratic angle of direction is indicated. Pure research watches the problem bud out in terms of more or less likely hunches⁴⁵ about other problems and other hypotheses. It listens to the suggestion of insight. On the other hand, practical research must find its problem first of all on the present level of social procedure. It must deal with existent societal status, and always with the direct purpose of improving present practice. If practical research is not able to announce some economically valuable discovery within a reasonable time, it fails.⁴⁶

W. W. Charters⁴⁷ says of so-called pure research that it consists simply of the selection of a definite problem from any source and the careful finding of a solution, without regard to any possible social or

⁴³ C. C. Crawford, *The Technique of Research in Education*. Boston: Houghton Mifflin Company, 1928.

⁴⁴ E. R. Downing, "The Elements and Safeguards of Scientific Thinking," *Scientific Monthly*, 26: 231, 232, 1928.

⁴⁵ L. T. Hogben, *Science for the Citizen*. New York: Alfred A. Knopf, 1938, pp. 648, 649.

⁴⁶ Karl Pearson, *The Grammar of Science*. New York: Charles Scribner's Sons, 1892.

⁴⁷ W. W. Charters, "Pure Research and Practical Research," *Journal of Educational Research*, 12: 95-101, 1925.

economic values that might accrue. On the other hand, he gives five definite steps for practical research.

1. A *going concern* is studied, measurements made, and points of weakness discovered.
2. Some one of these weaknesses is *selected* for investigation.
3. Then follows *solution in the laboratory*.
4. This is succeeded by the step of *installation* in which modifications must be made so that the solution will work in practice.
5. Finally, the solution must be *maintained* by placing it in the organization so that it will become a permanent part of the system.)

It would seem that Charters' characterization of pure research has in mind the Baconian method of indefatigable curiosity in the collection and organization of data. In the case of Darwin, this eventually merged into the tentative acceptance of a definite hypothesis. And it is easy to find many practical implications that have been derived from the theory of evolution and have had marked influence on social life.

It may be that the attempted distinction between pure and applied research is without value, because each has to do with a stage of progress in reflective thinking. Many instances of research projects might be cited in which the findings had no practical application at first, but which later were found to be of immense social or economic value.

Former President J. R. Angell of Yale University called attention to an essential similarity in so-called pure research and practical research in that both use the scientific method of reflective thinking, although they have different objectives. The aim of pure research is not found in the realm of specific human need. On the contrary, the problems of applied research always involve some definite issue in experience.

A distinction often drawn, and having a certain practical validity, is that between research in pure science and research in applied science. It is easy to magnify this distinction quite out of proportion to the actual facts. The objects of research in pure science and the motives inspiring the work may be appreciably different from those encountered in the field of applied science. But the technique of the procedure in the two cases may be all but indistinguishable and either variety of research, if it is to survive the test of scientific criticism, must be based upon absolutely fundamental scientific principles. In the last analysis, the difference reduces almost wholly to the psychological question of motivation. The man working in the field of applied science has before him a concrete specific issue involving some immediate practical exigency. The worker in pure science has quite as definite a specific problem, but it is not one which has arisen out of, nor which necessarily exists in

obvious relation to, an immediate demand. Beyond this I doubt if significant differences exist.⁴⁸

It would seem that the thesis suggested near the beginning of this chapter has some validity and that the concepts *science*, *thinking*, and *research* have a high degree of identity, when they are considered as method. The activities of each are in terms of the usual ordered mind processes of the normal person. Out of a feeling of doubt and a need for certainty, a definite question is isolated and a tentative solution selected for investigation. This, or some other better solution, is eventually accepted in the light of all evidence obtainable. But the process of evaluation of this generalization continues indefinitely, if prejudice or mental laziness are not permitted to close the mind; and reflection may repeatedly step up the philosophies of individuals and of social groups on to higher and higher levels. Standing on the shoulders of the generation just past, mankind ought repeatedly to improve its thinking and its living in terms of broader-minded attitudes based upon more detailed and more worth-while knowledge.

D. Summary

The thesis of this chapter is that a high degree of identity exists among the concepts reflection, science, and research.

The thought process is careful, ordered reflection. It arises out of a feeling of doubt and a need for certainty, from which a definite problem emerges. The most likely solution is examined in terms of all evidence available, obtained from all possible sources and by methods pertinent to the conditions of the problem situation. Finally, the best conclusion is tentatively accepted but is kept under continuous critical examination for open-minded evaluation of its prognostic value.

When the attitude and methods of reputable science are examined, an identical procedure from felt need to prediction is discovered. Scientific thinking is in terms of carefully organized reflection. Likewise, the methods of the best research are found to be scientific in terms of accepted mind processes, involving all essential steps in problem solving, through critical examination of hypotheses to final tentative corroboration of generalizations and succeeding search for certainty as a basis for action.

In fact, the careful thinker, whether in shop, office, or study, proceeds in terms of delayed action after a period of reflection, when evidence on solutions can be carefully weighed. This is the method of creditable research, in whatever field it is carried on.

⁴⁸ J. R. Angell, *Proceedings*. Association of American Universities. Chicago: University of Chicago Press, 1919, pp. 27, 28.

E. Research Exercises

1. Let the class or seminar organize as a committee of the whole and agree on a definition for research that will characterize the attitude and method of the group in the work they are undertaking.
2. Herbert Spencer defines a tragedy as a theory killed by a fact. Explain and illustrate.
3. Characterize the method and the essential contribution of the research workers mentioned in the paragraphs above.
4. What are the *social studies*? How do they differ from such realms of thought as physics, biology, and like disciplines? ⁴⁹
5. Define the words *objective*, *subjective*, *induction*, *deduction*, *pure research*, *practical research*.
6. Give illustrations of "the experimental attitude" in manufacturing, in business, and in educational administration, supervision, and teaching.
7. Give illustrations of actual educational research and of creditable research in the natural sciences. Justify your selection.
8. Is most educational research "pure" or "practical"? ⁵⁰ Give an illustration of each type.
9. Cite examples of pure research findings that were later found to have great practical economic value.
10. What is your favorite definition of educational research?
11. Let one half of the research group find, analyze, and report on educational investigations that are thoroughly scientific, and let the other half cite and characterize educational reports bearing small evidence of scientific attitude or procedure. Proceed in the same manner in the field of the natural sciences.
12. Illustrate what is meant by (a) science as *method*, and (b) science as *organized knowledge*.
13. (a) In what sense is science as knowledge not "respectable"? Illustrate. (b) Are the exact sciences exact? Illustrate.
14. Characterize and illustrate *custom*, *authority*, *speculation*, and *experimentation* as modes of human progress. Illustrate in terms of present and past educational practice.
15. Illustrate the basic difference between present-day philosophy and that of the Middle Ages.
16. Illustrate different levels of definiteness reached in the concepts of the physical sciences and of education.
17. Criticize the graphical representation of the thought process in Figure

⁴⁹ L. T. Hogben, *Science for the Citizen*. New York: Alfred A. Knopf, 1938, pp. 610 ff.

⁵⁰ Abraham Flexner, *Universities: American, English, German*. New York: Oxford University Press, 1930, pp. 14, 17.

1 and draw a better diagram, perhaps with concentric circles and radiating lines leading toward TRUTH.

18. How big must a generalization be to be classed as philosophical, not scientific only? Illustrate.

19. Is education scientific, or is it science? Illustrate.

20. Give an illustration of rationalization⁵¹ and of reasoning by analogy.⁵²

21. Read Dewey's illustrations of the five steps in the thought process; then write an original illustration, including Kelley's sixth step.

22. Which of these steps involve reasoning—ratiocination? Experimentation? Problem solving? Survey? Illustrate each.

23. Make a list of a dozen or more *lesser forms* of thought, deciding in each case which of the six Dewey-Kelley steps are omitted.

24. Find confirmation of the value of and necessity for an agendum of procedures in successful research.⁵³

25. Define scholarship, as related to research.⁵⁴

26. Find a characterization of increase in generalization and of continuity in the scientific method.⁵⁵

27. Can research solve the present world problems satisfactorily and finally? ⁵⁶

28. Is Dewey's "thinking" "discovery" only? ⁵⁷

⁵¹ C. A. and Mary R. Beard, *The Rise of American Civilization*. New York: The Macmillan Company, 1930, pp. 40-51.

⁵² Charles Darwin, *The Origin of Species*. New York: D. Appleton and Company, 1899, pp. 298-300.

⁵³ F. J. Kelly, *The American Arts College*. New York: The Macmillan Company, 1925, Appendix A, pp. 163-180.

⁵⁴ G. D. Wilson, "Scholarship and the College," *Journal of Higher Education*, 12: 29 ff, 1941.

⁵⁵ F. W. Westaway, *Scientific Method: Its Philosophical Basis and Its Modes of Application*. New York: Hillman-Curl, 1937, pp. 25-27, 41, 419.

⁵⁶ D. E. Scates, "On Our Research the Answers Hinge," *The Phi Delta Kappan*, 30: 120-124, 1948.

⁵⁷ M. J. Adler, *How to Read a Book*. New York: Simon and Schuster, 1940, pp. 43-46.

CHAPTER II

Research Traits and Abilities

IT HAS BEEN said in the preceding chapter that the beginner in research should give attention to the attitudes and activities of the master research thinkers. Chapter IV will deal with research values derived from an analytical, critical knowledge of research reports pertinent to the problem in hand. Among these, the procedures followed and the methods used (Chapter V) are particularly important, because they are as useful as a grasp of previous techniques and findings. The research methods give suggestions on the efficiency of tools for measurement and also tell the worker on what level of generalization he should begin reflective thinking. The procedures give hints on the actual research activities of other scientists, on their manner of procedure, and on their methods. It is not meant that the research worker should slavishly repeat procedures and methods and use identical techniques. If a problem reported on is attacked a second time, it should most often be in another location, with new groups of subjects, and with improved and better procedures, methods, and tools for measurement.

In addition to these matters of necessary value in previous research are the basic traits and attitudes exhibited in the work of the scientists. These motivating factors are of supreme importance in the conception and setting up of a creditable research project, as well as in the education of research workers, as they determine on what level of success the student will work during the period of his investigation. Attitudes appear as personal philosophies that shape the direction of reflective thinking. Research traits determine the efficiency of the attack in attempts at problem solving.

A. Research Activities

What procedures and methods characterize the activities of reputable scientists, of research men who have made important contributions to

the sum total of human knowledge? How did they carry on their work? In the analyses in Chapter I of the three largely synonymous concepts—reflection, science, and research—illustrations of the activities of a number of leaders in the realms of both the natural and the social sciences have appeared. For example, Charles Darwin¹ called his method *systematic inquiry* operating on Baconian principles. It involved years of more or less scattered induction. The variations in animals and plants were studied, but, for a long time, facts were collected and filed indiscriminately, without the guiding influence of a definite hypothesis. This method consumed a great deal of time and money. It required the leisure of a wealthy and highly intelligent semi-invalid such as Darwin, who was free from the economic and social distractions of everyday living.

¹ The method of T. L. Kelley illustrates a procedure feasible for ordinary minds, below the genius level of a Darwin. Here, a tentative solution of the problem is early adopted. This guides all efforts to get evidence on its value and its verification. The method of controlled experimentation is used, if at all possible. If the theory is found to be false, others are investigated until "a verified solution which is immediately serviceable is obtained."²

The necessity for recognizing the function of this tentative generalization in creditable research is emphasized by W. H. Kilpatrick.³ The conception and use of a likely hypothesis is actually an act of philosophy. In the attempted solution of a problem, the hypothesis determines the basic assumption underlying all activities of reflective thinking engaged in. And, as will be pointed out in Chapter V, underneath this ultimate aim is the ultimate-ultimate objective, the total social attitude of the group, in the location of the research, toward the area of human thought in which the question under investigation is found.⁴

Illustrating a complete list of activities in the carrying through of research investigations, the method of W. W. Charters and his asso-

¹ Francis Darwin, *The Life and Letters of Charles Darwin*. New York: D. Appleton-Century Company, 1911, Vol. I, Chap. II.

² T. L. Kelley, *Scientific Method: Its Function in Research and in Education*. New York: The Macmillan Company, 1932.

³ W. H. Kilpatrick, "The Relation of Philosophy to Scientific Research," *Journal of Educational Research*, 24: 97-114, 1931.

⁴ Roscoe Pound, "The Social Order and Modern Life," in *The Creative Intelligence and Modern Life*. Boulder, Colo.: University of Colorado Press, 1928, pp. 94-103; R. S. Lynd, *Knowledge for What?* Princeton, N. J.: Princeton University Press, 1939, pp. 56 ff; Carl Becker, *The Heavenly City of the Eighteenth Century Philosophers*. New Haven: Yale University Press, 1932, p. 47.

ciates may be cited. For example, the curriculum-making project at the University of Pittsburgh analyzed in Chapter VII may be taken.⁵ Here one finds the five definite research procedures listed by Charters himself.⁶ (a) The activities and the traits of commercial secretaries were analyzed for difficulties present. (b) This area of need, appearing as most frequent errors, was taken for course content. (c) The organized curriculum was tried out and perfected in college classes. (d) Prognostic tests were made in offices employing secretaries thus prepared. (e) The accepted attitudes and activities were assumed and practiced by succeeding employees, who had benefited from this type of preparation.

Thus it is seen that the essential activities of the complete process of reflective thinking, the Dewey-Kelley analysis, described in Chapter I, are found in the method of the reputable scientist. After the recognition of a difficulty in problem form, the most probable solution is carefully investigated in terms of pertinent evidence about its value. In the process of its verification, the initial feeling of need motivates everything done in the field of the study.

Brief reference will be made to the research activities of a number of world-famous thinkers, and the student should read and analyze carefully more complete accounts in each case. The name of Louis Pasteur will always be popularly known. It has been perpetuated in common speech in the word *pasteurize*, defined in the dictionary as to expose to a temperature of 140 degrees Fahrenheit for thirty minutes. One outstanding contribution of Pasteur's studies was the final replacement of the universally held theory of spontaneous generation by a knowledge of the facts of germ life in fermentation, putrefaction, and infectious disease.

Pasteur's research method is revealed in the following paragraphs, in which he states the difficulties he encountered in studying the problems of a Lille beet root alcohol manufacturer:

He spent some time almost daily at the factory. On his return to his laboratory—where he only had a student's microscope and a most primitive coke-fed stove—he examined the globules in the fermentation juice, he compared filtered with nonfiltered beetroot juice, and conceived stimulating hypotheses often to be abandoned in face of a fact in contradiction with them. Above some note made a few days previously, where a suggested hypothesis had not been verified by fact, he would write: "error," "erroneous," for he was implacable in his criticism of himself.

⁵ W. W. Charters and Isadore B. Whitley, *Analysis of Secretarial Duties and Traits*. Baltimore: Williams and Wilkins Company, 1924.

⁶ W. W. Charters, "Pure Research and Practical Research," *Journal of Educational Research*, 12: 95-101, 1925.

On his return to Lille he set to work with renewed energy; he took up again his study of fermentations, and in particular that of sour milk, called lactic fermentation; he made notes of his experiments day by day; he drew in a notebook the little globules, the tiny bodies that he found in a grey substance sometimes arranged in a zone. These globules, much smaller than those of yeast, had escaped the observation of chemists and naturalists because it was easy to confound them with other products of lactic fermentation. After isolating and then scattering in a liquid a trace of that grey substance, Pasteur saw some well-characterized lactic fermentation appear. That matter, that grey substance was indeed the ferment.

The year 1859 was given up to examining further facts concerning fermentation. Whence came those ferments, those microscopic bodies, those transforming agents, so weak in appearance yet so powerful in reality? Great problems were working in his mind; but he was careful not to propound them hastily, for he was the most timid, the most hesitating of men until he held proofs in his hands. "In experimental science," he wrote, "it is always a mistake not to doubt when facts do not compel you to affirm."⁷

Pasteur finally made the world-famous experiment with crooked-necked bottles. As a result of this, he identified dust-laden air as the source of germs. The most far-reaching and valuable contribution of his discoveries appeared in their application to surgery by Joseph Lister, a young physician in Glasgow, Scotland. He inaugurated the antiseptic method of treating septic wound infection accompanied by inflammation and "laudable pus." This method opened the door for modern operation and hospitalization. Strange to say, a young Vienna doctor had discovered the clue to the cause of sepsis some years before and independently of Pasteur's work; but the findings of this man, I. P. Semmelweis, were not known in western Europe for many years.⁸

Lister had long had a feeling of need, which finally crystallized into a definite problem.

In 1854, he showed a perfectly healing wound to Sir John Batty Tuke, then a young student, and said, "The main object of my life is to find out how to procure such a result in all wounds."

Lister's work is an outstanding example of the sincere but tentative acceptance of a theory from one realm of investigation, that of chemistry, and its evaluation and final verification in another field, that of human biology.

⁷ René Vallery-Radot, *The Life of Pasteur*. New York: Doubleday, Doran and Company, 1923, pp. 79, 83, 86.

⁸ P. H. DeKruif, *Men Against Death*. New York: Harcourt, Brace and Company, 1932, p. 7.

Thus it was that, when he read for the first time the conclusions of Pasteur as to the causation of decomposition in organic fluids, it was as if a man groping his way through darkness suddenly perceived the pathway lit up by the dawn.⁹

He repeated Pasteur's experiments with long, torsional-shaped flasks, and immediately the mind transition came. The human body was the flask. The skin, when unbroken, excluded external dust-carrying air. If microbe-laden dust could be excluded from open wounds, healing would be clean, without sepsis, antiseptic.

Concrete illustration of research methods that resulted in worth-while results may be found among the social scientists also. Auguste Comte was one of the first in modern times to attempt orderliness in thinking in the realm of human relationships. For unbridled imagination, he substituted ordered observation. His "encyclopedia" classified all knowledge in terms of less and lesser generality: (a) mathematics, (b) astronomy, (c) physics, (d) chemistry, (e) biology, (f) sociology, and (g) morals. The content of each science in this category depended upon all previous findings. There was possibility for definiteness and objectivity in sociology, then. *Positive Philosophy* was the concrete result.¹⁰ Here is the first important ordered attempt to analyze human relationship in terms of definite expressions of amount for measurement. This movement has gained great impetus in recent years¹¹ and has very probably reached its peak in the work of Vilfredo Pareto,¹² whose book is now available in translation. He attempts to express the nonlogical, the emotional, activities of group life in terms of definite, objective units of measurement. His method is that of patient, exhaustive analysis of the development of European social life in order to discover generalizations among the group activities based on feeling in social codes, religion, politics, and business.

Pareto's analysis and classification of these motivating forces, these sentiments, are in terms of their manifestation in human behavior. He

⁹ Cuthbert Dukes, *Lord Lister*. Boston: Small, Maynard and Company, 1925, p. 530.

¹⁰ Auguste Comte, *Positive Philosophy*. New York: Colvin, Blanchard, 1858.

¹¹ W. A. Binneweis, *A History and an Evaluation of the Quantitative Trend in Sociological Analysis*. Unpublished Doctor's Dissertation, University of Nebraska, 1929.

¹² Vilfredo Pareto, *The Mind and Society*. New York: Harcourt, Brace and Company, 1934; M. S. Handman, "The Sociological Methods of Vilfredo Pareto," Analysis 7 in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, pp. 139-153; Bernard DeVoto, "Primer for Intellectuals," *Saturday Review of Literature*, 9: 545, 546, 1933 and 9: 607, 1933 and "Sentiment and the Social Order," *Harper's Magazine*, 167: 569-581, 1933.

calls them *residues*. They comprise: (a) the instinct of combinations, which causes people to put together things and operations; (b) the persistence of aggregates, which tends to make combinations permanent; (c) the necessity for expressing sentiments by outward doing; (d) sentiments associated with man's social life, such as imitation, collectivity, altruism, and the like; and (e) the tendency to keep human relations intact. In explanation of these residues, Pareto proposes four *derivations*. *First* are merely simple statements of belief in personal action, without any attempt at logical proof; *second* are all explanations resting on tradition and authority; and *third* is explanation based on common sense and consensus of opinion. The *fourth* class includes derivations based on the authority of verbal proof, a play upon words. These nine concepts are proposed as units of measurement in order that a study of society may be reported in definite terms of change and temporal trend. It is hoped that they may perform a function similar, for example, to that of the foot and the pound in physics.

Herbert Spencer's *Synthetic Philosophy*¹³ may be compared in comprehensiveness to Comte's *Positive Philosophy*. In Spencer's *The Principles of Sociology*,¹⁴ which he wrote, it is said, without having read Comte, one finds another attempt to objectify the study of man. Spencer's lifelong objective was to square all human thinking and development with the hypothesis of evolution. He stated this concept as follows:

Evolution is an integration of matter and a concomitant dissipation of motion, during which the matter passes from an indefinite, incoherent homogeneity to a definite, coherent heterogeneity, and during which the retained motion undergoes a parallel transformation.¹⁵

In getting evidence on this theory:

He employed three secretaries to gather data for him, and to classify the data in parallel columns giving the domestic, ecclesiastical, professional, political, and industrial institutions of every significant people. At his own expense, he published these collections in eight large volumes, so that other students might verify or modify his conclusions.¹⁶

¹³ Herbert Spencer, *Synthetic Philosophy*. New York: D. Appleton-Century Company, 1910, Vols. I-X.

¹⁴ Herbert Spencer, *The Principles of Sociology*. New York: D. Appleton-Century Company, 1923-1925, Vols. I-III.

¹⁵ Josiah Royce, *Herbert Spencer: An Estimate and Review, Together with a Chapter of Personal Reminiscences by James Collier*. New York: Fox, Duffield and Company, 1904, pp. 210 ff.

¹⁶ Will Durant, *The Story of Philosophy*. New York: Simon and Schuster, 1933, p. 409.

After seven years, in 1876, the first volume of the *Sociology* appeared; the last volume was published in 1896.

Spencer's method of collecting data was more often by direct observation, rather than through the analysis of authorities. In fact, it is said that he never finished reading a scientific book.

His curiosity was ever awake, and he was continually directing the attention of his companion to some notable phenomenon . . . until then seen by his eyes alone.¹⁷

At the Athenaeum Club he pumped Huxley and his other friends almost dry of their expert knowledge; and he ran through the periodicals at the Club as he had run through those that passed through his father's hands for the Philosophical Society at Derby, "lynx-eyed for every fact that was grist to his mill." Having determined what he wanted to do, and having found the central idea, evolution, about which all his work would turn, his brain became a magnet for relevant material, and the unprecedented orderliness of his thought classified the material almost automatically as it came. No wonder the proletaire and the business man heard him gladly; here was just such a mind as their own—a stranger to book-learning, innocent of "culture" and yet endowed with the natural, matter-of-fact knowledge of the man who learns as he works and lives.¹⁸

The work of T. B. Macaulay in the field of historical research illustrates effective thinking methods and activities there. His general plan for the research, which resulted in the *History of England*,¹⁹ is indicated by the following statement:

The first part (which, I think, will take up five octavo volumes) will extend from the Revolution to the commencement of Sir Robert Walpole's long administration, a period of three or four and thirty very eventful years. From the commencement of Walpole's administration to the commencement of the American war, events may be dispatched more concisely. From the commencement of the American war, it will again become necessary to be copious. These, at least, are my present notions. How far I shall bring the narrative down I have not determined. The death of George the Fourth would be the best halting-place. The "History" would then be an entire view of all the transactions which took place, between the Revolution which brought the Crown into harmony with the Parliament, and the Revolution which brought the Parliament into harmony with the nation. But there are great and obvious objections to contemporary history. To be sure, if I live to be seventy, the events of George the Fourth's reign will be to me then what the American war and the Coalition are to me now.

¹⁷ Josiah Royce, *op. cit.*, p. 210.

¹⁸ Will Durant, *op. cit.*, p. 388.

¹⁹ T. B. Macaulay, *History of England*. Oxford, Eng.: Oxford Press, 1931.

While the work was in process and after two volumes had been published, Macaulay revised his activities in the following way:

I have now made up my mind to change my plan about my "History." I will first set myself to know the whole subject; to get, by reading and traveling, a full acquaintance with William's reign. I reckon that it will take me eighteen months to do this. I must visit Holland, Belgium, Scotland, Ireland, France. The Dutch archives and French archives must be ransacked. I will see whether anything is to be got from diplomatic collections. I must see Londonderry, the Boyne, Aghrim, Limerick, Kinsale, Namur again, Landen, Steinkirk. I must turn over hundreds, thousands, of pamphlets. Lambeth, the Bodleian, and the other Oxford libraries, the Devonshire Papers, the British Museum, must be explored, and notes made: and then I shall go to work. When the materials are ready, and the history mapped out in my mind, I ought easily to write, on an average, two of my pages daily. In two years from the time I begin writing I shall have more than finished my second part. Then I reckon a year for polishing, retouching, and printing. This brings me to the autumn of 1853. I like this scheme much. I began to-day with Avaux's dispatches from Ireland, abstracted almost a whole thick volume, and compared his narrative with James's. There is much to be said as to these events.²⁰

In the fields of biographical research and the writing of historical novels, two modern workers may be mentioned. Hervey Allen's method has been carefully described,²¹ but it is noted that he disclaims any conscious research attitude or activity. The method of work in the case of Harold Nicolson is analyzed as follows:

Having chosen a congenial subject, the next step is one of study or research. It is a question of method. My own method is invariable. First, I buy an enormous notebook strongly bound. Secondly, I obtain from the library, or purchase for myself, the most comprehensive textbook upon my subject which I can find. I then number the pages of my notebook and prepare an index at the beginning. I then take the dates of birth and death of my hero and write out a table at the end showing exactly what age he had reached in any given year. Having done this, I start to summarize my textbook. The first page will be headed "heredity," the third "parents and childhood," the fifth "school and early influences," and so on throughout the man's career. On page 50 or so of the notebook will start the sections on character, which in their turn will be carefully indexed. Thus, page 50 might be headed "epileptic tendency," page 51 "ambition," page 53 "selfishness," page 55 "sense of humor, lack of," and so on. All entries from

²⁰ G. O. Trevelyan, *The Life and Letters of Lord Macaulay*. New York: Harper & Brothers, 1904, Vol. 2, pp. 19-20, 193-194.

²¹ Hervey Allen, "The Sources of Anthony Adverse," *Saturday Review of Literature*, 10: 401, 408-410, 1934.

the main textbook must be made in black ink; the right hand page is folded in half, leaving the left hand page blank. By the time the main textbook has been annotated in this manner, the majority of the right hand pages will be filled if not with material, then at least with headings. The temptation to shirk these notes by taking them in the form of references must be strongly resisted. It is a mistake, for instance, to write on page 73 of one's notebook "for good story about his drinking see Havelock, Vol. II, page 353." Conversely, it is also a mistake to omit references which may be required later. The Havelock story must be summarized in your notebook and the salient passages quoted in inverted commas. At the end of the passage must appear the reference "Havelock, Vol. II, page 353." Only by such industrious methods can the material be properly digested, since, when, at a later stage, you begin actually to write the book, a mere reference will convey nothing to you, whereas to have to look up that reference a second time is a duplication of labor. Your main notebook must contain all the undigested material of the final work; it must not contain mere references to pages in other books.

Having read the main textbook, you must then purchase or acquire all the other books on the subject. According as you read these, you must insert the passages you may require to use on the right hand page of your notebook. If you have folded that page in half, you will be able to insert the additional information exactly opposite the relevant passage from the main textbook. Having read all the published works upon your subject you then enter a further stage—that of original research.²²

An eight-point summary of "the more obvious practices of careful research workers that need wider application"²³ has been given by A. S. Barr of the University of Wisconsin. First, more care in the statement of the problem at the beginning of the report is advocated; then, more careful definition of the factors and variables to be investigated is advised. At the same time, effective attention should be given to the validity, reliability, and objectivity of tests, interviews, questionnaires, and other fact-getting tools. The laws of sampling should be known and followed more carefully, as well as the law of the single variable in setting up controlled experiments. Here, also, as high an equivalence of groups involved as possible should be obtained, if that type of experimental arrangement is used. More knowledge and skill in the application of the simpler statistical procedures should be evident. This refers, for example, to the investigation of gains and differences for reliability. Finally, generalizations announced from experiments carried through should be considered with great care, and nothing should be claimed that would lie beyond the possibilities of

²² Harold Nicolson, "How I Write Biography," *Saturday Review of Literature*, 10: 709-711, 1934.

²³ A. S. Barr, "Research," *Journal of Educational Research*, 19: 56-57, 1929.

tools of measurement employed. The basic roughness of all social science data should be recognized. This will limit the generality of all conclusions.

Many more analyses of the activities of famous research thinkers might be cited.²⁴ If the student will read them carefully, he will find repeated confirmation of the conclusions of Chapter I. Their procedures seem to be well characterized in the six steps of the Dewey-Kelley thought process and in Downey's seven elements. So far as activities, things done, are concerned, there appears to be a high degree of identity, if not actual synonymity, among the concepts, *reflective thinking, science, research*.

B. Research Qualifications

In addition to needing an intimate knowledge of the details of how reputable research men work, the neophyte will be greatly benefited by a careful analysis of their personalities as well. This should stimulate concrete self-analysis. It may reveal, by introspection or through the judgment and rating of others, possible lacunae among the total of personal traits and abilities. It may call attention to irregular, one-sided development. This knowledge ought to be the first step toward the making of a new and better research character. It should make more possible successful use of such tried activities as those described in the preceding section. The value of the product of research depends fundamentally upon the intimate attitudes, traits, and abilities of the individual worker.

Search among the items of personality of world-famous thinkers brings to light many suggestions on obviously effective research qualifications. Francis Bacon, who sincerely tried, as a young man, to determine the best possibilities of his future lifework, gives the following introspective analysis:

Moreover, I found in my own nature a special adaptation for the contemplation of truth. For I had a mind at once versatile enough for that most important object—I mean the recognition of similitudes—and at the same time sufficiently steady and concentrated for the observation of subtle shades of difference. I possessed a passion for research, a power of suspending judgment with patience, of meditating with pleasure, of assenting with caution, of correcting false impressions with readiness, and of organizing my thoughts with scrupulous pains. I had no hankering after novelty, no blind admiration of antiquity. Imposture in every shade I utterly detested.

²⁴ J. G. Crowther, *Famous Men of Science*. New York: W. W. Norton and Company, 1937; Zsolt De Harsanyi, *The Star-Gazer*. New York: G. P. Putnam's Sons, 1939.

For all these reasons, I considered that my nature and disposition had, as it were, a kind of kinship and connection with truth.²⁵

Francis Galton, in his inquiry into the origin of genius, emphasizes the supreme importance of native intelligence, the best character traits, and work power, if one would succeed in any endeavor involving reflective thinking.

By natural ability, I mean those qualities of *intellect* and *disposition*, which urge and qualify a man to perform acts that lead to reputation. I do not mean *capacity* without *zeal*, nor *zeal* without capacity, nor even a combination of both of them, without an adequate *power* of doing a great deal of very *laborious work*. But I mean a nature which, when left to itself, will, urged by an inherent stimulus, climb the path that leads to eminence, and has strength to reach the summit—one which, if hindered or thwarted, will fret and strive until the hindrance is overcome, and it is again free to follow its labor-loving instinct.²⁶

Further insight into Galton's personality is found in the biography written by Karl Pearson of the University of London. In his analysis of physical and mental characteristics, one finds a rather complete picture comprising twenty items.

Physical. (1) Marked longevity. (2) Very considerable physical strength and power of endurance. (3) A well-knit figure somewhat above the average height and not tending to corpulence. (4) Regular features, with nothing unfinished, or at all unkempt about the person, generally what are described as "good looks." (5) Blue eyes and light hair. (6) Ailments, asthma and deafness. (7) Good digestion.

Mental. (1) Even temper. (Francis Galton himself has said that he had a quick temper only gradually brought under control by exercise. If this be so, the power of control was probably hereditary.) (2) Great sympathy. (3) Ascetic rather than sensuous. (4) Strong mechanical bent. (5) Keen delight in numerical evaluation and symbolic expression, two factors hardly to be put, perhaps, under one heading. (6) Strongly emphasized power of observation and appreciation of observation—what we might almost speak of as the "clinical instinct." (7) Marked love of adventure, the roving lust. (8) By no means a student or collector in the usual sense, neither a wide reader of books nor a worker in museums. (Galton rather observed and collected to answer a problem he had *a priori* proposed to himself, than studied material with a view to the discovery of some hidden secret.) (9)

²⁵ E. A. Abbott, *Francis Bacon*. New York: The Macmillan Company, 1885. Compare F. W. Westaway, *Scientific Method: Its Philosophical Basis and Its Modes of Application*. New York: Hillman-Curl, 1937, pp. 557 ff.

²⁶ Francis Galton, *Hereditary Genius: An Inquiry into Its Laws and Consequences*. New York: The Macmillan Company, 1892.

Continuous concentration in reading or analysis was liable to lead to "mental fog," and on two occasions in his life led to a breakdown. (10) An instinct almost amounting to a moral sense that the end of science was not so much knowledge for its own sake, as social utility and increased human efficiency. (11) Much steadfastness of purpose accompanied by a considerable power of controlling others and inspiring them to fulfill his planned ends. (12) A noteworthy sense of humor. (13) A great appreciation of the need for clear expression in science.²⁷

Professor Philipp Lenard, of Germany, in his study of Galileo, points out that this scientist's personality is an outstanding "example of the erroneous assumption of peculiar inborn gifts."

It may of course appear to the outsider as if important discoveries and great steps forward are the outcome of a special gift for guessing the secrets of nature. But enough scientific investigation, observation, and thought have always been performed by others previously, and thus sufficient insight into the actual behaviour of nature is already available and only requires to be worked upon further. This is often a comparatively easy matter for someone who has hitherto taken no part, and approaches the matter with a fresh mind. The earliest workers in science found little store of such knowledge; they had to make their own provision for it.²⁸

Galileo's development was unusually gradual. Starting at the University of Pisa with the required study of Aristotle, which did not appeal to him, he progressed through Euclid to the works of Archimedes. These inventions stimulated studies of floating bodies, the center of gravity, and specific gravity, and finally led to his discoveries with the telescope, which resulted in his persecution by the Roman Inquisition. Persistence in holding to a lifelong purpose to extend the boundaries of human knowledge, disregard of imprisonment and other outward restrictions, continuous reflection in the field of his interest—these traits characterize the personality of Galileo. His life illustrates the value of genius, of hunches, and of knowledge of previous research.

Lord Lister's research qualifications are briefly listed by Cuthbert Dukes, the London pathologist, as follows:

For the special work which he was to do Lister was exceptionally well endowed, partly by nature and partly by mental acquisition. He was sincere,

²⁷ Karl Pearson, *The Life, Letters, and Labours of Francis Galton*. London: University Press, 1914, pp. 55, 56.

²⁸ Philipp Lenard, *Great Men of Science*. New York: The Macmillan Company, 1933. Compare Zsolt De Harsanyi, *The Star-Gazer*. New York: G. P. Putnam's Sons, 1939.

single-minded, and very much in earnest. A man of "vision," he had also a wonderful talent for patient investigation into detail, for meeting difficulties without discouragement, for devising means to overcome them, and for inventing apparatus and methods of investigation where none had existed before. He possessed the gift of unusual mental insight, of getting straight to the point, of neglecting unessentials, and he was blessed with much common sense, probably derived from his Yorkshire ancestors. He had a splendid physique, and was able to endure much physical and mental effort.²⁹

One more characterization of thinking personality will be given—that of Herbert Spencer.

His character had the defects of its virtues. He paid for his resolute realism and practical sense by missing the spirit and zest of poetry and art. The only poetical touch in his twenty volumes was due to a printer who made Spencer speak of "the daily versification of scientific predictions." He had a fine persistence whose other side was an opinionated obstinacy; he could sweep the entire universe for proofs of his hypotheses, but he could not see with any insight another's point of view; he had the egotism that bears up the nonconformer, and he could not carry his greatness without some narrowness accompanying a courageous candor and an intense originality; sternly resisting all flattery, rejecting proffered governmental honors, and pursuing his painful work for forty years in chronic ill-health and modest seclusion; and yet marked, by some phrenologist who gained access to him—"Self-esteem very large." The son and grandson of teachers, he wielded the ferule in his books, and struck a high didactic tone. "I am never puzzled," he tells us. His solitary bachelor life left him lacking in the warmly human qualities, though he could be indignantly humane. He had an affair with that great Englishwoman, George Eliot, but she had too much intellect to please him. He lacked humor, and had no subtlety or nuances in his style. When he lost at his favorite game of billiards, he denounced his opponent for devoting so much time to such a game as to have become an expert in it. In his *Autobiography* he writes reviews of his own early books, to show how it should have been done.³⁰

"Herbert Spencer, whom I used to see at the Atheneum, and who seemed to me singularly unlovely. . . ." ³¹

It is desirable to bring together analyses like these, so that some generalized notion may emerge about the actual individual personal traits and abilities of well-known research men. T. L. Kelley, in his

²⁹ Cuthbert Dukes, *Lord Lister*. Boston: Small, Maynard and Company, 1925, p. 52.

³⁰ Will Durant, *The Story of Philosophy*. New York: Simon and Schuster, 1933, p. 389.

³¹ N. M. Butler, *Across the Years: Recollections and Reflections*. New York: Charles Scribner's Sons, 1939.

fifth lecture at Ohio State University, in 1928, commented on such an undertaking.

An attempt to form a composite picture of mental traits of men of science will show many ill-defined features. There are at least two important reasons for this. First: the traits demanded in one scientific field differ from those in a second. Second: the traits facilitating success in one generation differ from those in a second having different social restrictions. With these two conditioning factors in mind we may still make a few generalizations. My study of men of science, a sample of which I have given here, leads me to think that there are no exceptions to the following:

- a. The great man of science is industrious, shows great mental energy, and is persistent on the trail of discovery.
- b. He questions authority, at least in the one line of his greatest achievement.
- c. He is apt at drawing inferences, and is therefore ingenious in making hypotheses.
- d. His sense of logic is sound, so that he is perspicacious in making deductions.
- e. He is a keen observer of natural phenomena.
- f. He is dependent on observed facts.
- g. He is inventive in the matters of techniques.
- h. He is rich in his variety and number of hypotheses.
- i. He is not "inspirational" in his chosen field; that is, his feet are always on the ground—his hypotheses are always amenable to some test of a factual or observational sort. But he is inspirational in the sense that a vision not the common property of fellow-men urges him on.

The following are common, but not universal, traits of the scientific man:

- j. He lacks personal attachment to a hypothesis—he will slay his own mental offspring, or if he does not actually kill an erroneous hypothesis that he has given birth to, he will let it die from inattention.
- k. He is disputatious.
- l. In his person much transfer of training takes place, for he adapts to one field a device, method, or hypothesis drawn from another field.
- m. He is versatile in his interests, and even in his native abilities.
- n. He is tolerant.

The following are traits which are not uncommon:

- o. In his person erroneous transfer takes place, for he reasons by analogy without warrant.
- p. He has a good memory.
- q. He has good mathematical ability, even though mathematics is not his major activity.
- r. He has excellent motor coordination and manipulative ability.
- s. He has a thorough knowledge of antecedent work.
- t. He has a deep religious feeling.

TABLE I
RANK ORDER OF SEVENTY RESEARCH TRAITS LISTED, OR IMPLIED IN TRAIT
ACTIONS GIVEN, AS FOUND IN ELEVEN REPORTS SELECTED
AT RANDOM, 1922-1932 ^a

Rank	Trait or aptitude	Frequency of mention
1	2	3
1	Reasoning power	9
2	Accuracy	7
3.5	Intellectual honesty	6
3.5	Open-mindedness	6
5.5	Objectivity	5
5.5	Originality	5
9	Discernment	4
9	Good memory	4
9	Independence	4
9	Persistence	4
9	Purposefulness	4
15	Alertness	3
15	Application	3
15	Executive ability	3
15	Humility	3
15	Impartiality	3
15	Native intelligence	3
15	Self-confidence	3
26	Cooperation	2
26	Consistency	2
26	Constructivity	2
26	Courage	2
26	Drive	2
26	Efficiency	2
26	Faith	2
26	Keeness of observation	2
26	Logicity	2
26	Mental energy	2
26	Poise	2
26	Scholarship	2
26	Scientific skill	2
26	Self-control	2
26	Special aptitudes ^b	2
34 to 70	Ambition, apprehension, creativeness, curiosity, desire for truth, desire to excel, detachment, disputatiousness, egotism, generosity, good sense, great patience, health, hobby-loving, imaginative, industrious, inspirational, inventive, judgment, leadership, manipulative ability, modesty, nonsocial, perseverant, precocious, prudence, quiet determination, reasoning by analogy, religiosity, research zeal, self-appraisal, serious attitude, sincerity, teaching aptitude, tolerance, unchangeableness, versatility	1

- u. He is generous.
- v. He is precocious in his development.

The following are traits which are not unknown in men of science:

- w. He is egotistical.
- x. He is modest.
- y. He has hobbies.
- z. He is not sociable.
- aa. His ancestors are of more than ordinary distinction.³²

A summation of eleven analyses of desirable research qualities is given in Table I. The sources were selected on the basis of availability, but they include a representative group of social science workers. The breadth of conception of what research implies, as reported by the seventy items of the table, is significant; but it may be that many of the words could be telescoped, so that the list would be reduced to perhaps half its length. Of course, frequency of mention is not a final criterion of desirability, but whatever agreement appears at the top of the table should be very suggestive. The first half dozen traits—reasoning power, accuracy, intellectual honesty, open-mindedness, objectivity, and originality—are certainly very important to the research worker, and should be well considered by the neophyte in reflective thinking. However, it may be that such items as health, curiosity, poise, desire for truth, or sincerity, appearing farther down the table,

^a J. C. Bay, "The Training of a Research Worker in Education," *School and Society*, 25: 274-278, 1927; B. R. Buckingham, "Research," *Educational Research Bulletin*, 6: 164-165, 1927; S. A. Courtis, "The Development of Ability in Research," *Studies in Education*. National Society of College Teachers of Education, Chicago: University of Chicago Press, 1926, Yearbook XV; P. W. L. Cox *et al.*, *An Outline of Methods in Research with Suggestions for High School Principals and Teachers*. Washington: United States Bureau of Education, 1926, Bulletin No. 24; Milton Fairchild, *The Scientific Method*. Washington, D. C.: Character Education Institute, 1926; J. M. Hughes, "The Educational Worker and Scientific Ideals," *American School Board Journal*, 78: 60, 142, 1929; T. L. Kelley, *Scientific Method: Its Function in Research and Education*. New York: The Macmillan Company, 1932; W. G. Reeder, *How to Write a Thesis*. Bloomington, Ill.: Public School Publishing Company, 1930; C. E. Seashore, *The Gifted Student and Research*. Twenty-fourth Annual Conference of the Association of American Universities. National Research Council, Washington, D. C., 1922; W. E. Spahr and R. J. Swenson, *Methods and Status of Scientific Research*. New York: Harper & Brothers, 1930, Chap. II; H. A. Toops, *The Selection of Graduate Assistants*. Columbus, Ohio: Ohio College Association Bulletin No. 31.

^b Mathematical ability, statistics, shop work, drafting, typing, clerical work, laboratory work, photography, stenography, calculating machine operation, mimeographing, medical work, physiology, artistic ability, and others.

³² T. L. Kelley, *Scientific Method: Its Function in Research and Education*. New York: The Macmillan Company, 1932.

are of as great, or greater, importance in research success as are accuracy and alertness. Careful discussions like that in Chapter II of Spahr and Swenson will aid in making a final judgment here.³³

Personal checks of research attitudes and possibilities will have the value of any sincere introspective analysis.³⁴ The earnest student will benefit by such a process; and he will not go far wrong if he begins at the top of this list (Table I). Certainly, he will be definitely improved in the application of the scientific method to any problem he may attack, if he sets out to develop his own reasoning power, to attain accuracy, and always to be honest, open-minded, and objective in his attitude. Personality may be and has been changed by taking thought.³⁵

The making of definitely arranged score cards for the analysis of research abilities is suggested below. One of these cards is given as Table II. It is said to be for the purpose of securing:

a fairly clear picture of a student's endowment for original work. The record should give a profile, showing the relative prominence of each of the features listed. A man may be very high in one capacity and low in another. No person is uniformly high or low in all. These capacities are not of equal value. One feature may be essential for one field of pursuit; another feature for another. The records should never be averaged.

This inventory should operate, (a) to discover fitness for graduate study regardless of what the present plans of the student may be, (b) to serve as a talking point in conference with the student, and (c) to furnish information to universities and research institutions about the availability of candidates for graduate stipends and honors.

(a) This blank is prepared primarily for the use of committees concerned with superior attainment. The registrar selects the three instructors (preferably from different departments) with whom the student has had most advanced work and asks each of them to make an independent rating. (b) The blanks may be used by voluntary groups of students who agree to rate one another for mutual self-help. (c) A student may profitably make an inventory of himself. (d) The form may be used for a transcript of all rating, signatures being omitted. In this case a chart is plotted by drawing jagged lines through the ten check marks by each judge. For statistical purposes records may be converted into percentages.

When a whole class can be rated by the same person, or group of persons,

³³ W. E. Spahr and R. J. Swenson, *Methods and Status of Scientific Research*. New York: Harper & Brothers, 1930.

³⁴ J. D. Heilman and W. D. Armentrout, "The Rating of College Teachers on Ten Traits by Their Students," *Journal of Educational Psychology*, 27: 197-216, 1936; H. H. Remmers, *The College Professor as the Student Sees Him*. Studies in Higher Education XXVI. Lafayette, Ind.: Purdue University, 1928.

³⁵ Ernestine M. Lambdin, *A Problem in the Development of Personality*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1934.

TABLE II
A SCORE CARD FOR FITNESS FOR GRADUATE STUDY
STATE UNIVERSITY OF IOWA, 1922 ^a

Traits, attitudes, and abilities	Very poor 10 per cent	Poor 20 per cent	Low average 20 per cent	High average 20 per cent	Excellent 20 per cent	Superior 10 per cent
I	2	3	4	5	6	7
1. <i>Reasoning power</i> : capacity for solving problems, both deductive and inductive..						
2. <i>Originality</i> : creative imagination, brilliancy, planful initiative, and fertility of rational ideas						
3. <i>Memory</i> : extensive, logical, serviceable, and ready command of facts						
4. <i>Alertness</i> : quick, incisive, and responsive observation, thought, and feeling						
5. <i>Accuracy</i> : precise, keen, regular, and reliable observation, thought, and feeling						
6. <i>Application</i> : power of concentration, sustained attention, persistence, and well-regulated effort						
7. <i>Cooperation</i> : capacity for intellectual companionship, team work, and leadership						
8. <i>Moral attitude</i> : intellectual honesty, wholesome moral standards, ideals, and influences						
9. <i>Health</i> : nervous stability, physique, vitality, and endurance						
10. <i>Zeal for investigation</i> : deep interest in and craving for original and creative work						

^a C. E. Seashore, *The Gifted Student and Research*. Twenty-fourth Annual Conference of the Association of American Universities. Washington, D. C.: National Research Council, 1922.

the method of analyzed rank should be used. Each member of the entire class will then be rated on each of the ten points and the rating may be transferred to this chart.³⁶

Tests to determine ability to use scientific method have been developed in the Bureau of Educational Research at Ohio State University, Columbus, Ohio. In reporting progress, F. P. Frutchey, Research Associate, writes:

In working with teachers three aspects of scientific method have been emphasized. These three are the interpretation of experimental data, the application of principles, and the testing of promising hypotheses. These tests have been developed for the junior college level. However, some of them have been tried at the high school level and found to be appropriate there. I don't know that any of them have been tried at the graduate level. For graduate students the situation may need to be made more complex. We have in mind some promising methods for testing two or three aspects of scientific method using the same situation.³⁷

A number of reports of work with the science subjects have been made.³⁸

C. Education in Research

In general, one finds vocational outlets for research increasing year by year. World War II was an immense stimulus to group research. The research laboratories of manufacturing plants are well known, and their budget totals are impressive. Witness a typical annual research budget by the Bell Telephone Company of \$19,000,000. Machine research has mechanized society in terms of all electrical appliances, the automobile, the airplane, the radio, television, and similar inventions. The next advance will be in the realm of chemical research, and the effect upon social living will very probably be as profound and fundamental. Already, agriculture has turned over the raising of many products to synthetic processes. Examples of such are rayon, perfumes, and the like; and synthetic rubber has arrived, as well as synthetic milk and other foods. In 1927, it was estimated that scientific research cost \$217,000,000 in the United States.³⁹ Since then, under

³⁶ C. E. Seashore, *op. cit.*

³⁷ F. P. Frutchey, "Measuring the Ability to Apply Chemical Principles," *Educational Research Bulletin*, 12: 255-260, 1933.

³⁸ A. G. Horney, *Testing Understanding of Chemical Principles*. Unpublished Master of Arts Thesis, Ohio State University, 1932.

³⁹ Frank Knox, "A Stake in the Country," *Review of Reviews*, 92: 22-24, 1935; W. W. Parish and H. F. Clark, "Chemistry Wrecks the Farm," *Harper's Magazine*, 171: 272-282, 1935; C. M. A. Saine, "Debunking Research," *Nation's Business*, 31: 215-248, 1929.

the stimulus of the Federal bureaucracy, there has been unprecedented increase in interest, activity, and expenditure in research projects, culminating in the recent findings in the realm of atomic energy. The Works Progress Administration reported that private industry alone was using from \$150,000,000 to \$200,000,000 annually in research budgets. These projects are found, in many cases, in the social science field. Even before 1937, Congress had appropriated approximately \$200,000 each for national studies of American land-grant colleges, secondary schools, teacher education, and public school finance (Appendix IV). Later, many national and state-wide research investigations were undertaken, such as the national health survey, the Tennessee Valley Authority project involving both natural and social science research, and many others. The subvention of research by many private foundations has furnished and is providing many research opportunities also. See Bulletin No. 1, issued each January by the United States Office of Education, for the current list of foundations. The Rockefeller and the Carnegie Foundations are outstanding examples. In 1929, the Commonwealth Fund made a report of progress in *The Commonwealth Teacher-Training Study*,⁴⁰ after having used the sum of \$42,000. In 1938, the Commission on Teacher Education of the American Council on Education began a five-year cooperative implementation study of the preparation of teachers among thirty-four collegiate institutions and school systems.⁴¹ This was financed by the General Education Board to the amount of over \$600,000. The same foundation provided over \$250,000 for a study of junior college terminal education, made by the Commission on Junior College Terminal Education of the American Association of Junior Colleges, 1941.⁴² Grants made during 1939-1940 by the Carnegie Corporation of New York for "research, studies, and publications" totaled \$2,026,947.

An analysis and evaluation of nineteen "Educational Research Studies of National Scope or Significance" has come from David Segel, Educational Consultant, United States Office of Education.

⁴⁰ W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929.

⁴¹ Karl W. Bigelow, *The Commission on Teacher Education: A Brief Statement of Its Origin and Scope*. Washington, D. C.: American Council on Education, 1940.

⁴² W. C. Eells, *A Report on Terminal Education in Junior Colleges with Special Emphasis on an Explanation of the Continuation Study, 1941-1944; Present Status of Junior College Terminal Education*, Terminal Education Monograph No. 2; and *Why Junior College Terminal Education?* Terminal Education Monograph No. 3; Lois E. Engleman and W. C. Eells, *The Literature of Junior College Terminal Education*, Terminal Education Monograph No. 1. Washington, D. C.: American Association of Junior Colleges, 1941.

In general the studies selected have the following characteristics: They deal with the gathering and analysis of original data; most of them are of national scope and all of them are considered to be of widespread significance; and they have been reported upon since 1936, but not later than July 1, 1940. In addition, several of the studies were planned by national committees or other national agencies. Deliberative reports by national committees or agencies are omitted since this report is intentionally limited to research studies using original data.⁴³

I. STUDIES OF ACCREDITATION

1. Principles of Accrediting Higher Institutions (North Central Association of Colleges and Secondary Schools)
2. Cooperative Study of Secondary School Standards (Regional Associations of Secondary Schools and Colleges)

II. CITY SCHOOL SURVEYS

3. Philadelphia (Philadelphia Board of Education)
4. St. Louis (St. Louis Board of Education)

III. STATE SURVEYS

5. Nebraska (Nebraska State Planning Board)
6. New York (Regents of the University of the State of New York)

IV. SURVEYS OF EDUCATIONAL ORGANIZATION AND ADMINISTRATION

7. Local School Units (United States Office of Education)
8. Federal Government and Education (Advisory Committee on Education)

V. STUDIES OF ADJUSTMENT OF SCHOOL CHILDREN AND YOUTH

9. Youth Tell Their Story (American Youth Commission)
10. Adult Study (General College of the University of Minnesota)
11. Personnel Research Study (General College of the University of Minnesota)
12. Intelligence: Its Nature and Nurture (National Society for the Study of Education)
13. Studies in the Identification of Problem Children (Minnesota State Department of Education)

⁴³ David Segel, "Educational Research Studies of National Scope or Significance," Chapter X in J. W. Studebaker, *Biennial Survey of Education in the United States, 1938-1940*. Washington, D. C.: United States Office of Education, 1942, Vol. I.

VI. 14. STUDY OF THE RELATIONS OF SECONDARY AND HIGHER EDUCATION IN PENNSYLVANIA

VII. FEDERALLY SPONSORED RESEARCH STUDIES OF NATIONAL SCOPE

- 15. Project in Research in Universities (United States Office of Education)
- 16. Research Projects in Education (Work Projects Administration)

VIII. STUDIES OF RESEARCH METHODOLOGY

- 17. Methods of Research in Education (American Educational Research Association)
- 18. The Scientific Movement in Education (National Society for the Study of Education)
- 19. Educational Research: Its Nature, Essential Conditions, and Controlling Concepts (American Council on Education)

As never before, the number of research workers needed to carry on the ordered reflective thinking of society is impressive. F. C. Harrington of the Works Progress Administration has reported 50,000 persons as employed in industrial research alone, a fourfold increase over a twenty-year period. The up-surge of national defense industries multiplied this total. Organized research centers are increasing in number and importance also. In 1930, thirteen state teacher-education institutions reported having directors of research. Later, seventeen such persons were listed in about one out of every five teachers colleges.⁴⁴ The number of research offices in state departments of education is increasing, and hundreds of city school systems have organized well-equipped and adequately budgeted research bureaus, including offices for curriculum revision.

Analyses like that reported in Table III reveal the details of the actual activities of such research organizations. The items of greater frequency at the top of the table may be concretely suggestive of what should be included first of all in a curriculum for research workers. It is certain that knowledge of achievement and mental testing will

⁴⁴ F. L. Whitney, "The Organization, Scope, and Cost of a Department of Research," *Ninth Yearbook*. American Association of Teachers Colleges, Washington, D. C.: National Education Association, 1930; "Research in Teacher Training," *Journal of the National Education Association*, 20: 45, 46, 1931; G. W. Frasier, *et al.*, *Experiments in Teachers College Administration*, Baltimore: Warwick and York, 1929.

TABLE III
 FORTY-ONE RESEARCH FUNCTIONS REPORTED BY BUREAUS OF
 EDUCATIONAL RESEARCH IN FIFTY-EIGHT SCHOOL
 SYSTEMS, IN UNIVERSITIES, AND IN STATE
 DEPARTMENTS, 1929 ^a

Functions	City		University		Teacher education		State	
	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank
1	2	3	4	5	6	7	8	9
1. Achievement tests.....	100	1	100	1	90	1.5	80	2
2. Organization and supervision of special classes...	58	10	0	0	0	0	0	0
3. Curriculum revision.....	54	11	0	0	0	0	0	0
4. Psychological clinic.....	51	12	0	0	0	0	0	0
5. Mental tests.....	93	2	93	2.5	90	1.5	60	7
6. Experimental study of administrative problem...	48	13.5	0	0	0	0	0	0
7. Vocational guidance.....	36	19.5	0	0	0	0	0	0
8. Surveys.....	76	5.5	86	4	70	5.5	60	7
9. Compiling budget.....	33	22	0	0	0	0	0	0
10. Textbook analysis.....	31	23	0	0	0	0	0	0
11. Professional library service	28	25	0	0	0	0	0	0
12. Training teachers for special testing.....	23	27	0	0	0	0	0	0
13. Classification.....	86	3	57	9.5	60	8	60	7
14. Test construction.....	60	9	71	5.5	60	8	60	7
15. Special investigations other than surveys.....	76	5.5	57	9.5	70	5.5	80	2
16. Experimental study of curricular problems.....	81	4	64	7.5	80	3.5	40	12.5
17. Special administrative duties.....	20	28	0	0	0	0	0	0
18. Attendance and enrollment service.....	19	29	0	0	0	0	0	0
19. Administration of school census.....	15	30.5	0	0	0	0	0	0
20. Lecture service.....	15	30.5	0	0	0	0	0	0
21. Student personnel problems.....	41	16	50	11.5	80	3.5	0	0
22. Distribution of tests for publication.....	10	32.5	0	0	0	0	0	0
23. Supervisory assignments..	10	32.5	0	0	0	0	0	0
24. Business and accounting service.....	9	34.5	0	0	0	0	0	0
25. Special extension of regular functions.....	9	34.5	0	0	0	0	0	0
26. Guiding research duties...	43	15	93	2.5	50	11	60	7
27. Answering questionnaires.	7	36.5	0	0	0	0	0	0
28. Advisory functions.....	7	36.5	0	0	0	0	0	0
29. Preparation of reports...	5	38.5	0	0	0	0	0	0

^a Mimeographed report from the Bureau of Research, Indiana State Normal School, Muncie, 1929.

TABLE III (Continued)

Functions	City		University		Teacher education		State	
	Per cent	Rank	Per cent	Rank	Per cent	Rank	Per cent	Rank
1	2	3	4	5	6	7	8	9
30. Psychiatric clinics.....	5	38.5	0	0	0	0	0	0
31. Devising records and reports.....	74	7	71	5.5	40	14	40	12.5
32. Americanization service other than informational	3	40	0	0	0	0	0	0
33. Adult education other than informational	2	41	0	0	0	0	0	0
34. Educational guidance.....	48	13.5	30	17	50	11	0	0
35. Training teachers for special testing.....	66	8	43	14.5	60	8	10	15
36. Educational information..	36	19.5	64	7.5	40	14	60	7
37. Checking building plans...	29	24	50	11.5	30	16	0	0
38. Publicity service.....	39	17	28	18	40	14	60	7
39. Teaching service.....	36	19.0	43	14.5	50	11	40	12.5
40. Preparation of bibliographies.....	26	26	43	14.5	10	17	80	2
41. School finance other than budgeting.....	36	19.5	43	14.5	0	0	40	12.5

be necessary, as well as a good background in psychology and in the experimental method. Martin's 1941 check finds curriculum research to be the most frequent type engaged in, with study of laboratory-school problems a close second. Next in rank order come psychological research, evaluation of alumni activities, and guidance and student personnel.

The sum total of these activity items in all types of research centers, including Federal offices and the private welfare foundations, would constitute a complete listing of everything done. However, it may be that it would not be feasible to use an all-inclusive activity analysis as the basis for actual course content preparatory to research work in the field. In addition to the criterion of total frequency, information should be gathered about those items among which are found errors, the difficulty analysis.

Errors in any realm of activity are expensive.⁴⁵ The scamping of material in wall construction in southern California has cost many lives and much property value during earthquake disturbances. After World War I, many thousands of dollars' worth of boats floated in a

⁴⁵ Joseph Jastrow, editor, *The Story of Human Error*. New York: D. Appleton-Century Company, 1936.

Western harbor, useless ever since construction because of engineering mistakes. The Hoover Commission has reported many areas of inefficiency and waste in federal activities. The large amounts of Federal money now available for research should cause sincere efforts for the elimination of errors in agenda of plans set up. In addition to funds for the support of research coming from industry and individuals, over one hundred foundations disburse over one half a billion dollars annually. Table IV distributes the total of these subventions among four areas. It is seen that the social sciences are next to the physical sciences in emphasis. The latest analysis⁴⁶ of the activities of these foundations reports 186 of them disbursing a total of \$56,779,000. The report is not analyzed to show relative emphasis on education, social action, and research.

Search among the published suggestions of reflective thinkers reveals errors in attitude, in method, and in techniques. For example, the dozen negative personality characteristics pointed out by Fairchild⁴⁷ are particularly significant: diverted by personal interests, complacent, hysterical or melancholy, superficial, indifferent, lacking initiative, suggestible, impulsive, lazy and dilatory, haphazard, ruled by likes and dislikes, timid. Kelley sums them up in these words: "holdbacks that slow down progress are (a) individual stupidity, prejudice, and preconceptions, and (b) social taboos. The first of these are probably as ubiquitous as in the past."⁴⁸

TABLE IV
TYPES OF ACTIVITY SUPPORTED BY FOUNDATIONS, 1931-1932^a

Field	Total grants paid in support of			
	Education	Social action	Research	Total
I	2	3	4	5
1. Medicine and public health	\$10,600,437	\$ 4,447,256	\$ 2,096,488	\$17,144,181
2. General education . . .	13,498,416		80,782	13,579,198
3. Social sciences	2,867,435	226,600	2,748,113	5,842,148
4. Physical sciences	813,681		3,859,704	4,673,385
5. All other activities . . .	3,333,527	8,221,909	1,810,255	13,365,691
Total	\$31,113,496	\$12,895,765	\$10,595,342	\$54,604,603

^a The Twentieth Century Fund, *American Foundations and Their Fields*. New York: The Twentieth Century Fund, 1931-1932, Vol. II, pp. 16-17.

⁴⁶ W. S. Rich and Neva R. Deardorf, *American Foundations and Their Fields*, VI. New York: Raymond Rich Associates, 1948.

⁴⁷ Milton Fairchild, *The Scientific Method*. Washington, D. C.: Character Education Institute, 1926.

Perhaps, on the theory of the efficacy of the "horrible example," one or two actual concrete illustrations of bad scientific and research attitudes should be cited. In Leonard Huxley's compilation of his father's letters is found a reference to the characteristics of a number of contemporary scientists who were being considered as authors for certain subjects in a new edition of the *Encyclopaedia Britannica*. For example, of one of these men, T. H. Huxley says:

I think ——— is like enough to do the "Coelenterata" well, if you can make sure of his doing it at all. He is a man of really great knowledge of the literature of zoology, and if it had not been for the accident of being a procrastinating impracticable ass, he could have been a distinguished man. But he is a sort of Balaam-Centaur with the asinine stronger than the prophetic moiety.⁴⁰

On another occasion, when a certain "X" had been suggested as collaborator in a symposium on *English Men of Science*, Huxley exclaims, "But I won't have 'X.' He is too much of a bolter to go into the tandem." At least five undesirable attitudes are implied in these illustrations: unreliability, laziness, lack of foresight, prejudice, and inability to cooperate.

Coming nearer home in time and place, a certain student in a certain graduate school matriculated and received a remarkably high score in the mental test, but failed to do well in his classwork and made poor progress in planning his research study. He was not admitted to candidacy for the higher degree, and when questioned by his adviser, replied that he believed it was foolish to work so hard, that everybody "ought to have some fun once in a while!" Another beginner illustrated the opposite status for "individual stupidity"; and, after the mistake was made of admitting him to candidacy, his deficiencies were not supplemented by sufficient personal interest and research skill on the part of his faculty adviser. And perhaps the most serious cases of all, many illustrations of which might be given, exhibit the closed-mind acceptance of prejudices and preconceptions, which determine at the beginning of a research project that it will never reach a very high level of generalization in the thinking process. Too often this results from too hearty an acceptance of an ultimate objective, formulated early in the investigation, and adhered to as a definitely crystallized, airtight thesis in spite of any new evidence

⁴⁰ T. L. Kelley, *Scientific Method: Its Function in Research and Education*. New York: The Macmillan Company, 1932.

⁴¹ Leonard Huxley, *Life and Letters of Thomas Henry Huxley*. New York: D. Appleton-Century Company, 1901.

appearing on an hypothesis that should have been held tentatively only. The student takes the erroneous attitude that he is "trying to prove something."

Discussions of errors in method and in techniques in research are not hard to find. Table V gives eight lists selected at random from outstanding educators. The remarkable thing to note is that, whereas the total of indictment by each author is very similar, that of attempted unscientific thinking, yet one does not find very much overlapping in the phraseology of the eight statements. This is an indication of the uncertainty in the terminology of expressions for educational concepts, already commented on as a measure of the distance education has yet to go to become a true science.

Serious errors and difficulties in research *attitude*, found in Table V, are (a) emotionalism, (b) jealousy, (c) overconfidence, (d) closed-mindedness, (e) illogical slovenliness, (f) carelessness, (g) inconsistency, (h) intellectual dishonesty, (i) poor judgment, (j) ambiguity, and the like.

Among the more serious difficulties in research *method* listed are such as (a) adjusting accepted theories to the feeling tone of majorities, (b) publication of half-truths, not to mention known untruths, (c) the hasty delimitation and definition of problems, (d) hasty reporting, (e) resorting to the prestige of authority instead of depending upon factual evidence, (f) lack of cooperative research setups, (g) argument from silence or from analogy, (h) willful blindness to negative evidence, (i) general conclusions from too meager a sampling, and (j) substituting probability for established fact.

Very serious errors in techniques and the use of research *devices* are such as (a) inaccuracies in defining units of amount, (b) a careless use of percentages, (c) comparisons on the basis of incomparable units such as raw scores of different denominations, (d) normative checks on the basis of point measures only, (e) inaccuracies in calculation, (f) constant errors resulting from blunt instruments of precision, (g) quantitative, but no qualitative, analysis of data, (h) attempts to hold factors constant in the presence of overlapping categories, and other violations of the law of the single variable, (i) interpreting correlation as causation, and (j) too great accuracy unwarranted by the roughness of original data.

P. M. Symonds of Teachers College, Columbia University, has summarized under six heads what he considers to be common faults found in the work of graduate students:

(1) That the emphasis on the gathering of facts has been poorly correlated with the application of these facts to the educational program; (2) that the

TABLE V
RESEARCH ERRORS IN ATTITUDE, METHOD, AND TECHNIQUE
LISTED FROM EIGHT SOURCES, 1919-1930

Fairchild ^a	Brooks ^b	Whipple ^c
1	2	3
1. Adjusting theories to popular likes and dislikes.	1. Announcement of half truths and untruths.	1. Accepting unverified samplings.
2. Blindness to negative facts.	2. Ascribing too great accuracy to data.	2. Arithmetical inaccuracy.
3. Carelessness in observations.	3. Assuming normality of distributions without reporting their true form.	3. Attack of futile problems.
4. Cowardice in supporting an unpopular truth.	4. Careless use of percentages.	4. Careless and inadequate measurement.
5. Discussion only in reporting (no interpretation).	5. Combining and comparing units of different kinds.	5. Failure to complete reliabilities.
6. Egoism in announcing "new" theories.	6. Comparing groups in terms of point measures only.	6. Hasty formulation of problems.
7. Emotionalism during research.	7. Drawing unreasonable conclusions.	7. Ignorance of the work of predecessors.
8. Forming hypotheses without facts.	8. Failure to include the maximum number possible of variables in a study.	8. Ignorant use of methods of the classification of data.
9. Ignorance and wrong use of tools of precision.	9. Hasty reports.	9. Neglect of direct observation.
10. Ignorant opposition to theories.	10. Inaccurate scoring.	10. Neglect of the trial study.
11. Impatience with research procedures.	11. Inadequate testing.	11. Presenting results unintelligently.
12. Inaccuracy in determining units.	12. Making incorrect and unwise interpretations.	12. Presentation and discussion of data, but no interpretation.
13. Inventing interesting theories for sale.	13. Nonuse of the scatter diagram to determine by what method to calculate a correlation coefficient.	13. Quantitative, but not qualitative, analysis.
14. Jealous opposition to another's theories.	14. Nonvalid and unreliable tests used.	14. Rushing into print too soon.
15. Overconfidence in results.	15. Poor sampling.	15. The use of a poor questionnaire.
16. Persistent belief in a disproved theory.	16. Tentative conclusions.	16. Too frequent use of the questionnaire.*
17. Poor planning for research.	17. Using very rough basic data.	17. Violation of the law of the single variable.
18. Propagandism for unproved hypotheses.		

^a Milton Fairchild, *The Scientific Method*. Washington, D. C.: Character Education Institute, 1926.

^b F. D. Brooks, "Criteria of Educational Research," *School and Society*, 18: 724-729, 1923.

^c G. M. Whipple, "The Improvement of Educational Research," *School and Society*, 26: 249-259, 1927.

TABLE V (Continued)

Crawford ^d	Jernegan ^e	Alexander ^f
1	2	3
1. Comparing incompatible things.	1. Argument from silence.	1. Poor reporting.
2. External inconsistency.	2. Argument from analogy.	2. Statistical errors.
3. False major premise.	3. False conclusions.	3. Too great accuracy.
4. Ignoring negative evidence.	4. False interpretation of facts.	4. Unanalyzed totals.
5. Inadequate sampling.	5. Facts without evidence.	5. Use of indefinite units.
6. Internal inconsistency.	6. Inaccurate quoting.	6. Useless statistics.
7. Mistaking correlation for causation.	7. Misstatement of facts.	7. Unsound treatment.
8. Mistaking part for whole.	8. Plagiarism.	
9. Refusing criticism.	9. Substituting probability for fact.	
10. Unrepresentative data.		
11. Violating the law of parsimony.		
12. Yielding to false suggestions.		

^d C. C. Crawford, *The Technique of Research in Education*. Boston: Houghton Mifflin Company, 1928.

^e M. W. Jernegan, Department of History, University of Chicago, in C. C. Crawford, *op. cit.*

^f Carter Alexander, *School Statistics and Publicity*. New York: Silver, Burdett and Company, 1919; and *Educational Research*. New York: Bureau of Publications, Teachers College, Columbia University, 1929.

background of information and understanding of the student is often meager and shallow; (3) that certain fundamental assumptions which are often tacitly understood give the research a particular bias and make it of limited value; (4) that theses sponsored by and often financed by groups or theses addressed to certain groups are often biased; (5) that choice of methods of investigation or of the instruments to be used in the investigation is often faulty; and (6) that there are a number of technical faults that are commonly seen in the statistical methods used and the preparation of the manuscript.

Symonds concludes that research is

. . . not something that can be ground out as by a machine. Educational research can never be made a mechanical process. There is no problem worthy of study that does not include unknown elements and does not

TABLE V (Concluded)

Toops ^a	Almack ^b
1	2
1. Creation of arbitrary rules.	1. Careless, vague, and ambiguous use of terms.
2. Failure to put research on a big-scale efficiency basis.	2. Constant error due to lack of precision in the instruments used.
3. Ignoring of the factor of time and individual practice curves.	3. Constant error due to the prejudice or bias of the observer.
4. Lack of cooperative research attack.	4. Errors due to writing from memory.
5. Lack of fertility of research hypotheses.	5. Errors in clerical and record-keeping activities.
6. Overlapping categories in following the principle of the single variable.	6. Errors in the mathematical manipulation of data.
7. Paucity of test scales for measuring college success.	7. Errors of judgment, and illusion or false perceptions.
8. Paucity of test scales for measuring environmental factors.	8. General conclusions from too few observations.
9. Too small populations (too few experiments repeated).	9. Variable error either in the observer or in the instruments.
10. Unreliable measures of attainment (undifferentiated objectives).	10. Wrong inferences.
11. Unreliable test scores (attenuated correlation coefficients).	

^aH. A. Toops, "The Meaning of Scientific Inquiry in Education," Chapter I in *Quantitative Measurement in Institutions of Higher Learning*. Eighteenth Yearbook, National Society of College Teachers of Education. Chicago: University of Chicago Press, 1930.

^bJ. C. Almack, *Research and Thesis Writing*. Boston: Houghton Mifflin Company, 1930.

require a fresh approach and attack. Too much of the research done by students in recent years has smacked of the mechanical or merely following the methods and procedures of some predecessor without clear insight into the problem itself or the methods to be used in attacking it. Much of the research in education that is being published fails to receive recognition because it lacks that spark of originality that must accompany an attack on a new problem. Research methods and techniques can be taught, but after they are mastered there is still the problem of attacking a new problem and genuine contribution to education cannot be made without the willingness to pioneer into new fields or to work out new procedures. Genuine research must be an exploration, a gamble, and every student who undertakes to do research must be of necessity taking a chance. The sure-fire problem whose end is visible from the beginning does not constitute genuine research. Any student who wishes to undertake research in education must be willing to

take a venture into the unknown and only by so doing will he bring back the fruits of genuine discovery.⁵⁰

A curriculum for the preparation of research workers, which would include items of difficulty in attitude, method, and technique, such as those described above, might go far toward raising the efficiency of reflective thinkers in the field and increasing the value of their findings. It might also eventually have a salutary effect on that part of the teaching personnel of institutions of higher education that is responsible for the guidance of the beginning research worker. The problem of error and of meeting unavoidable research difficulties is of vital importance to him. Undue cost and increase in time used are sometimes almost fatal to his project. As a rule, the total drain on the student's private dynamo of energy comes from so many other sources that adequate expenditure for research is almost impossible.

What, then, should an adequate curriculum for the preparation of research workers be? What specific educational opportunity should the beginner expect in order that he may have effective attitude, knowledge, and skill for an attack on the problems that he must solve in connection with investigations carried on?

A number of suggestions have been made. First, there is that background of scientific tolerance in attitude and point of view without which true research is impossible. That veteran scientist in the field of psychology and education, G. M. Whipple, for many years secretary of the National Society for the Study of Education, emphasizes this point. The implication is that this should be provided for in the curriculum of the lower schools.

We refer to the study of education today as the "scientific study of education," and we all take pride in being connected with this movement, in part because it is thus regarded as a scientific movement. It is my purpose this morning to consider what it means, after all, to be scientific, and to what extent we succeed—and to what extent we do not succeed—in being truly scientific in our chosen profession.

As for me, it was not until I was more than halfway through my college course that I had occasion even to reflect upon this theme, and, so far as I can remember, despite the fact that I had taken several courses in science before that time, that was the first occasion that any one had called my attention to the essential spirit of science and to the nature of scientific method applied to research.

Before developing my theme, I would like to take a few minutes to comment upon this anomaly, because I feel quite sure that the conditions under

⁵⁰ P. M. Symonds, "Common Faults in Graduate Research in Education," *Journal of Educational Research*, 26: 492, 1934.

which students of the present day pursue much of their work in the sciences are not much better than they were a generation ago, so far as this matter of training in scientific method is concerned. I say this because I have asked various high school graduates to tell me what science aimed to do and what they understood scientific method to be, but have never received a clear reply to either question. Similarly, I have asked numerous high school teachers of science to what extent they were able, in their chemistry, their physics, or their biology, to inculcate an appreciation of the spirit, methods, and aims of science, and have received from most of them the confession, "Practically none at all." Yet will you not grant that it is more important for a high school graduate to have gained a notion of the spirit of science than it is for him to know how far a body falls the first second in a vacuum, or to be able to state Avogadro's hypothesis? I think so, at any rate. In my opinion, one of the greatest needs of our day is the training of our abler students in the appreciation of scientific method—at least so far as to develop in them that attitude of tolerance, of freedom from bias and prejudice, that ability to disentangle opinion from fact that is the essence of science. If no more than 10 per cent of our citizenry could gain that objectivity of attitude that science embodies, we should hear less of Scopes' trials and less of the unfortunate efforts of fervent legislators to dictate the courses of study of our public schools.⁵¹

One or two suggestions for specific course programs in research will be cited. J. C. Bay of the John Crerar Library, Chicago, would include in the curriculum (a) "a substantial year of philosophy," (b) "a year of mathematical analysis on the college level," and (c) "a year of statistics, with emphasis upon statistical analysis."⁵² C. C. Crawford of the University of Southern California emphasizes the necessity for a combination of the apprentice method with direct class instruction.⁵³ The program would consist of (a) the collection of suitable material bearing on the methods of research, (b) the incorporation of this into the content of a research course, and (c) individual advice and assistance. Another suggestion by P. M. Symonds is that a course in educational research should consist of a treatment of the most frequent things done in connection with actual researches completed.⁵⁴ An analysis of twenty-one doctors' dissertations from Teachers College, Columbia University, yielded a total of 201 items. The fifty of greatest

⁵¹ G. M. Whipple, "The Improvement of Educational Research," *School and Society*, 26: 249-259, 1927.

⁵² J. C. Bay, "The Training of a Research Worker in Education," *School and Society*, 25: 274-278, 1927.

⁵³ C. C. Crawford, "Training Research Workers," *Journal of Educational Research*, 8: 366-370, 1926.

⁵⁴ P. M. Symonds, "A Course in the Technic of Educational Research," *Teachers College Record*, 29: 24-30, 1927.

frequency constitute the course proposed. What is needed here is really a thick source book in educational research.

It seems evident that the beginner in research is entitled to expect at least three opportunities by way of preparation: (1) a basic *curriculum in reflective thinking* extending through twelve years of experience in the lower schools and four years of undergraduate work;⁵⁵ (2) adequate *information about research*; and (3) expert *education in research* methods and techniques. As to the first of these, Whipple's characterization of deficiency just given is very probably not overdrawn. Improvement in reflective thinking should come with a general rise in the value of curriculum applications and increase in skill in teaching methods, as provided for childhood and youth. The institutions of higher education have a responsibility here, that of leadership and of the provision of facilities for educational research that will aid in a solution of these problems in elementary and high school and in their own realm of activity as well.⁵⁶

As to needed information about research, a differentiation and reorganization of courses now offered in schools of education and teachers colleges ought to give all facts needed in general and in the specific field of endeavor in which the beginner is interested. It should be recognized that research in making the master's and doctor's studies, as well as actual later work in a research office or department, are definite professional activity objectives analogous to teaching in the field or to administering a city school system.

If this is true, in addition to knowing about the activities in the field, tools to be used, and entities to be handled, the beginner in research is entitled to effective education in the procedures that are involved in successfully carrying on research studies. It is believed that this can be done in no other way than (a) by definitely organizing courses in the statistical method and in an understanding of the logical research procedures of science, and (b) by sincere, careful personal advice and guidance by a competent, experienced educational research worker of accepted ability as scientist and as teacher through the procedures of one or two worth-while investigations. J. C. Bay takes the following attitude toward research advice in institutions of higher education:

⁵⁵ J. J. Goldstein, *Open-mindedness Can Be Taught*. Philadelphia: Philadelphia Public Schools, 1949.

⁵⁶ H. A. Toops, "The Meaning of Scientific Inquiry in Education," Chapter I in *Quantitative Measurement in Institutions of Higher Learning*. Eighteenth Yearbook, National Society of College Teachers of Education. Chicago: University of Chicago Press, 1930; R. W. Tyler, "Training Courses for Research Workers," *Educational Research Bulletin*, 11: 169-179, 1932.

Before passing to the constructive or creative aspect of a research worker's activity, we turn aside to remark that if graduate faculties of schools of education were doing a better job, we would now be saved some unnecessary labor. Graduate faculties provide no competent guidance for their students, and apparently they are untroubled about it. To the critic it seems that it would be a small job for a big strong faculty to examine at least a hundred concrete examples of alleged creative graduate work, describe lucidly the methods of their construction, and then to devise a scale of merit for measuring the quality of master's and doctor's theses. The construction of such a scale would be relatively easy, since in this case one of the major difficulties of scale construction would hardly appear at all, namely, the location of an acceptable zero point.⁵⁷

The guidance of the beginning research student is of obvious importance in the light of ultimate success or failure. It is well known that the graduate departments of the institutions of higher education differ widely in their aid and their supervisory organization for this purpose. The medieval attitude on the part of a faculty that the advanced student is guilty of inefficiency until he proves himself worthy is slowly being replaced by very useful definite plans for the advice of the new research worker, so that the cost of making his research study may be a minimum within the limits of ultimate value.

A number of rather detailed descriptions of university plans for the guidance of graduate students, so that inefficiencies and errors may be avoided during the prosecution of their research investigations, have been published. Nine describe the situation at Ohio State University, the University of Chicago and the University of Cincinnati, the University of Illinois, the University of Southern California, Stanford University, the University of Pennsylvania, the College of the City of New York, and the history departments of Ohio State University and the University of Nebraska.⁵⁸ It is believed that the faculty of a

⁵⁷ J. C. Bay, "The Training of a Research Worker in Education," *School and Society*, 25: 274-278, 1927.

⁵⁸ W. G. Reeder, *How to Write a Thesis*. Bloomington, Ill.: Public School Publishing Company, 1930; C. V. Good, *How to Do Research in Education*. Baltimore: Warwick and York, 1928; W. S. Monroe and M. D. Engelhart, *The Techniques of Educational Research*. Urbana, Ill.: University of Illinois, 1928, Bulletin No. 38; C. C. Crawford, "Training Research Workers," *Journal of Educational Research*, 8: 366-370, 1926; J. C. Almack, *Research and Thesis Writing*. Boston: Houghton Mifflin Company, 1930; W. C. Schluter, *How to Do Research Work*. New York: Prentice-Hall, Inc., 1927; H. H. Abelson, *The Art of Educational Research: Its Problems and Procedures*. Yonkers: World Book Company, 1933; H. C. Hockett, *Introduction to Research in American History*. New York: The Macmillan Company, 1932; F. M. Fling, *The Writing of History*. New York: The Macmillan Company, 1926.

graduate department has a distinct type of responsibility toward each student who is accepted for matriculation. Perhaps they are not personally responsible for final success in his research project, but they should provide adequate opportunity for him to show his worth and to prove the possibilities involved in his native intelligence, academic ability, and specific equipment for research work in the chosen field.

This means, in addition to well-organized research courses and seminars, (a) a careful selection of each individual on the basis of past record and on entrance tests in intelligence and aptitude, (b) a thorough tryout for a specified period of time in classwork on the graduate level and in the planning of his research study, and (c) a definitely announced decision very early in his graduate experience on acceptance or rejection to candidacy for a higher degree.

D. Summary

Knowledge of the details of the actual research activities of outstanding reflective thinkers is essential to success in the carrying through of research projects in similar fields. Of more importance are the concrete suggestions that their personal research traits and attitudes furnish. These determine finally the efficiency of the attack made in problem solving.

The research activities, the methods of reputable scientists in the natural and the social fields conform to the complete process of reflective thinking given in the Dewey-Kelley analysis of six steps.

Sincere introspection with regard to the common personality traits and attitudes of outstanding research men is of value for beginners in reflective thinking. The more important items found are such as reasoning power, accuracy, intellectual honesty, open-mindedness, objectivity, originality, discernment, excellent memory, independence, persistence, purposefulness, alertness, application, executive ability, and the like.

The organization of research courses and seminars for the preparation of research workers is necessary because of the recent increase of vocational opportunities in city, state, and nation, as well as in co-operative research centers both public and private.

A complete analysis of all actual activities in such situations would yield all possible items of attitude, information, and skill that might be taught. However, school time and costs dictate that only the results of a difficulty analysis can be included in the content of course offerings. Important negative *attitudes* thus determined include emotionalism, overconfidence, traditional-mindedness, inconsistency,

and the like. Errors in *method* to be considered should include biased interpretation, inadequate reporting, careless definition of problems, argument from silence or from analogy, and so on. Serious mistakes in *techniques* and devices include inaccurate definition of units of measurement, attempted comparisons of units of different denominations, inaccuracies in calculation, and similar carelessnesses.

E. Research Exercises

1. Analyze the titles of Trevelyan, Darwin, Cramer, Durant, Vallery-Radot, Pasteur, DeKruif, Abbott, and Spencer listed in this chapter; and make a table of *traits* found similar to Table I.

2. Make a similar table of *methods*.

3. Make a similar table of *techniques*.

4. Rate yourself on the ten research traits of the Iowa score card.

5. Arrange for a group of beginners in research (perhaps a research seminar in a university or a teachers college) and have each member rate the others by using the Iowa score card, or another that you may devise. Then make a composite profile for the group.

6. Organize a self-instruction program in desirable traits by choosing those in which you are deficient, selecting trait actions for each, and distributing them over certain definite time periods. See Benjamin Franklin's character-education course for personal improvement.⁵⁹

7. Organize a similar curriculum of desirable research methods.

8. Organize a similar curriculum of desirable research techniques.

9. Make a score card for ability and success in science from the conclusion of Kelley's lecture on "Mental Traits of Men of Science."⁶⁰

10. (a) Illustrate how you can be "just as scientific in method" as Pasteur or Leonardo da Vinci. (b) Report on the personal traits and research methods of your ideal scientist. (c) Report on the personal traits and research methods of your ideal educational scientist. (d) Take one of the outstanding modern practical scientists like Edison and rate him on the Iowa scale or on some other scale you may choose to use.⁶¹

11. Give additional illustrations of roughness of measurement in the objective world resulting from the personal equation and from other environmental influences.

⁵⁹ Benjamin Franklin, *The Autobiography of Benjamin Franklin*. Boston: Houghton Mifflin Company, 1906.

⁶⁰ T. L. Kelley, *Scientific Method: Its Function in Research and Education*. New York: The Macmillan Company, 1932, pp. 192-229; J. R. Shannon, "Traits of Research Workers," *Journal of Educational Record*, 40: 513-521, 1947.

⁶¹ Catherine M. Cox, *The Early Mental Traits of Three Hundred Geniuses*. Stanford, Calif.: Stanford University Press, 1926.

12. Have we any adequate unit of measurement for the educational product?⁶²

13. Give illustrations of cases in research where progress has been held back and slowed down by (a) individual stupidity, (b) prejudice, (c) pre-conception, (d) social taboos.

14. (a) Rank each of the eight sections in Table V in order of seriousness. (b) Search for identity in the meaning of items in the eight lists in Table V and draw lines to connect cases of overlapping, if any are found.

15. (a) Is native intelligence correlated positively with research ability in education? Answer this by finding the Pearson coefficient of correlation between the intelligence tests scores of a group of 100 masters of art in education and the total value of their research reports (theses) rated on scales such as are suggested in Chapter XVI. (b) Carry the problem farther by partialing out concomitant variables such as marks in college classwork in the graduate school, social and economic background measured by Heilman's revision of the Chapman-Sims Scale,⁶³ salary in last educational position,

16. (a) Make a tabular list of qualifications that a beginner in educational research should have. (b) What are the details of the requirements in personal qualifications for the beginner in educational research in the graduate institution that you are attending?

17. Report on the actual number of graduate students in residence (a) in university schools of education, and (b) in teachers colleges in 1930-1931, 1940-1941, and 1948-1949. See the reports of the United States Office of Education and the catalogs, yearbooks, and bulletins of the educational institutions.

18. Report on research departments, offices, and bureaus in city school systems by bringing Townsend's data up to date.⁶⁴

19. Report on departmental research groups in state departments of education by bringing Chapman's data up to date.⁶⁵

⁶² F. H. Swift, *A History of Public Permanent School Funds in the United States, 1795-1905*. New York: Henry Holt and Company, 1911; L. P. Ayres, *An Index Number for State School Systems*. New York: Russell Sage Foundation, 1920; G. W. Frasier, *The Control of City School Finances*. Milwaukee: Bruce Publishing Company, 1922; H. M. Hamlin, "Measurement of the Effect of School Instruction Through Changes in Community Practice," *Journal of Educational Research*, 18: 315-317, 1928; J. K. Norton, *A Self-Survey Plan for State School Systems*. Washington, D. C.: National Education Association, 1930, Research Bulletin 8, Nos. 2 and 3; F. M. Phillips, "Educational Rank of States, 1930," *American School Board Journal*, 84: 25-29, 37-39, 1932.

⁶³ J. D. Heilman, "Revision of the Chapman-Sims Socio-Economic Scale," *Journal of Educational Research*, 18: 117-126, 1928, and other factors.

⁶⁴ M. E. Townsend, "Function and Organization of Educational Research Bureaus," *American School Board Journal*, 75: 37-40, 1927.

⁶⁵ H. B. Chapman, "Bureaus of Research and Statistics in State Departments of Education," *Educational Research Bulletin*, 7: 276-280, 1928.

20. Report on definitely organized curriculum revision departments in city school systems. Do these provide good vocational outlets for preparation in educational research? Answer in terms of specific cases of appointment.

21. What are the activities of a well-organized department of educational research?⁶⁶

22. What are the specific items of preparation for educational research provided by the institution that you are attending?

23. How many of the lower schools and the undergraduate colleges teach the scientific attitude well and obtain actual skill in reflective thinking? Report outstanding cases.⁶⁷

24. Let the class act as a committee of the whole to report on specific undergraduate and graduate courses that are essential to the present and future success of the educational research worker.

25. What may be the place of the informal research seminar in the preparation of the educational research worker? See former President G. S. Hall's account of his psychology seminar at Clark University.⁶⁸

⁶⁶ G. W. Frasier and F. L. Whitney, *Teachers College Finance*. Greeley, Colo.: Colorado State Teachers College, 1930, Chap. X; F. L. Whitney, "Educational Research," Chapter I in G. W. Frasier, *et al.*, *Experiments in Teachers College Administration*. Baltimore: Warwick and York, 1929.

⁶⁷ Benjamin Wood and F. S. Beers, "Knowledge versus Thinking?" *Teachers College Record*, 37: 487-499, 1936.

⁶⁸ G. S. Hall, *Life and Confessions of a Psychologist*. New York: D. Appleton-Century Company, 1923; S. L. Pressey and J. E. Janney, *Casebook of Research in Educational Psychology*. New York: Harper & Brothers, 1937.

CHAPTER III

The Research Problem

AN ALERT, open-minded point of view toward life's experiences is essential to reflective thinking. For example, the important thing is that the educator have the research attitude, that he give free rein to constructive imagination while he is engaged in teaching, supervision, or administration. If this attitude is maintained, the day's activities will be accompanied by a feeling tone of need in terms of a series of conscious recognitions of deficiency. This is in accord with the first step of the thinking process, as analyzed in Chapter I. There may be difficulties of adapting means available to ends desired or required. For example, chemical laboratory apparatus may be lacking. Or an item in the immediate environment, perhaps a section in the textbook used or a mathematical formula, may defy identification. Or it may be that an unexpected classroom happening proves too difficult for immediate explanation and solution. Whatever it be, if there is a *felt* difficulty, the thought process has started. Granted normal intelligence, a problem begins to appear.

A. The Origin of the Problem

The problem comes out of a situation in which there is a recognition that something is the matter, that unsolved difficulties exist. It is said that Darwin derived his idea of possible important problems in the field of evolution from reading Malthus on population. It has been seen in Chapter I that Adams finds the problems in American history, which he attacks, in the neural apperceptive mass supplied by past family and personal experience and research. W. C. Mitchell of Columbia University tells how the source of the economic problems that became his life work was found in certain academic courses that he took as an undergraduate. He says:

Business cycles turned up as a problem in the course of the studies which

I began with Laughlin. My first book on the greenbacks dealt only with the years of rapid depreciation and spasmodic wartime reaction. I knew that I had not gotten to the bottom of the problems and wanted to go on.¹

In the case of W. F. Ogburn of the University of Chicago,² personal and group preconceptions and interests determined the choice of the problem, the "political thought" of "social classes" in the state of Oregon. There was the presence of a set of concepts growing out of a more or less definite philosophy and peaking up to the question considered. There was, also, the circumstance of personal location of the men who conducted the research. No doubt the suggestion came from the thinking of many citizens and from the announcement of solutions in terms of regulations and laws. Further data were easily available to use in getting evidence on hypotheses tentatively adopted.

The origin of a problem that involved the making of an invention,³ a tool for measuring the size of families, is found to consist in:

(a) inherited mental ability; (b) the presence of the basic and necessary cultural elements that go into the making of the invention; (c) the social situation which directs the attention, trains the individual, and creates the need.⁴

To take an illustration from a more familiar situation, there is the case of a certain young high-school teacher who was struggling through the first month of the term without a background of modern teacher education or any supervised previous experience. He felt badly handicapped by these deficiencies to the extent of an extreme inferiority complex, as it would be called in these days. His superintendent called on him one day after school, and after some conversation said, "Well, John, are you discouraged?" Upon the faltering reply, "Yes, some," he said heartily, "Good! There is some hope for you, then!" John was ready to think about his needs, was ready to discover, in the murk of the dark cloud of his troubles, centers of difficulty that upon examination would appear as problems capable of solution.

¹ K. M. Clark, "Wesley C. Mitchell's Contribution to the Theory of Business Cycles," Analysis 47 in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, p. 679.

² W. F. Ogburn and Delvin Peterson, "Political Thought of Social Classes," *Political Science Quarterly*, 31: 300-317, 1916.

³ Edgar Sydenstricker and W. I. King, "The Measurement of the Relative Economic Status of Families," *Quarterly Publication of the American Statistical Association*, 17, No. 135, 842-857, 1921.

⁴ W. F. Ogburn, "A Device for Measuring the Size of Families, Invented by Edgar Sydenstricker and W. I. King," Analysis 12 in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, p. 211.

The beginner in the field of research, if his early experiences follow the normal pathway, will approach the period of time, the graduate year or membership on a research committee perhaps, when he is to give major attention to ordered reflective thought, with a background of activities in his field of endeavor out of which has come repeated recognition of deficiencies in knowledge or in skill, a number of which still trouble his conscious memory and may be made to stand out as distinct problems crying for solution.

The origin of the problem, whether it be in everyday living or in the field of educational activities, is in the region of those experiences charged with emotion among which careful search will reveal certain questions that can be transmuted to a feeling tone of satisfaction on some level of solution.

B. The Selection of a Problem

Out of this group of recognized problem situations, a choice has to be made, so that they may be dealt with one at a time. How this may be done in group research in public school systems is illustrated by the administrative arrangements for curriculum revision in Denver, Colorado, and in Tulsa, Oklahoma. In Denver,⁵ problems involved in course reconstruction are dealt with constantly, year after year, by classroom-teacher committees for the different school subjects. In Tulsa,⁶ a different segment of the curriculum is attacked each year under the leadership of supervisory members of the local staff, with technical advice from a specialist from some institution of higher education, where work is continued by the group during the succeeding summer session.

In the case of students working toward a higher degree, it has been suggested that they should arrive on the campus with a list of problems isolated from their recent professional experience and with one, most crucial and at the same time feasible, selected tentatively for the thesis work. Then faculty advice will be given on the value of this selection. But great differences are found with regard to such desirable initiative and independence. These are caused by variations in native intelligence, in types of academic courses pursued, and in kinds of previous professional experience. In some cases, of course,

⁵ A. L. Threlkeld, *Denver Program of Curriculum Revision*. Denver, Colo.: Denver Board of Education, 1927, Monograph No. 12.

⁶ M. C. Prunty, *The Administration of Curriculum Reconstruction in Tulsa, Oklahoma*. Unpublished Doctor's Field Study, Colorado State Teachers College, 1934.

there has been no educational experience, the student going on directly from bachelor's degree to the master's and perhaps the doctor's. Further, participation in larger studies, in which the faculty adviser is interested, is desirable and can often be arranged. For example, one student⁷ took part in a state-wide investigation of high-school opportunities⁸ financed by the state education committee of the Scottish Rite Masons. Two others found their thesis problems in the local segment of Study Number Seven of the W.P.A. Project in Research in Universities of the United States Office of Education.⁹

A group of students found their masters' problems¹⁰ in Colorado State College of Education in a number of research surveys resulting in a textbook on economics.¹¹ A master's study must of necessity be only a small piece of research, confined usually to the time limits of one academic year. For this reason, in addition to participation in faculty research, cooperative studies among groups of students are desirable, if carefully organized and conducted. For example, eighteen students once attacked extracurricular problems, and their adviser

⁷ H. H. Hadley, *Size of Administrative Unit and School Efficiency in Colorado*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1927; D. P. Cottrell, "Cooperation in Research," *Advanced School Digest*, 6: 13-17, 1940.

⁸ F. L. Whitney, *High School Opportunities in Colorado*. Greeley, Colo.: Colorado State Teachers College, 1927, Research Bulletin No. 12.

⁹ W. J. Greenleaf, *Economic Status of College Alumni*. Washington, D. C.: United States Office of Education, 1939, Bulletin, 1939, No. 10; Urith S. Abbott, *The Economic Status of Teachers College Masters, 1928-1936*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1937; Anna O. Ditgen, *The Socio-Economic Status of College Alumni Mathematics Majors*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1937.

¹⁰ Jane Church, *Business Skills and Information Needed by Every Individual as Determined by an Investigation of the Actual Experiences of Laymen*, 1932; Dorothy Dick, *Basic Business Information and Skills Needed by Every Individual Based on an Investigation Among Professional Men*, 1932; Beatrice H. Frutchey, *Basic Business Information and Skills Needed by Everyone as Shown by an Investigation Among Governmental Agencies and Public Service Companies*, 1931; Martha Hanson, *Business Skills and Information Needed by Everyone as Determined by an Investigation of Experiences of Laymen in North Dakota*, 1933; Harriet M. Milley, *Business Information and Skills Needed by Everyone as Determined by a Survey of Recent Magazines and Newspapers*, 1930; J. C. Odom, *Grade Placement of General Business Information*, 1932; Frances L. Ross, *Basic Business Facts and Skills Everyone Should Know as Determined by a Survey of Business Men's Organizations*, 1930; Minnie Sublette, *Business Information and Skills Needed by Everyone as Shown by an Investigation Among Bankers, Real Estate Men, and Insurance Agents*, 1930; V. L. Wise, *Fundamental Business Knowledge and Skills*, 1932.

¹¹ A. O. Colvin, *Practical Economics*. Greeley, Colo.: Tribune-Republican Publishing Company, 1933.

wrote a summary and interpretation.¹² Another group of prospective masters in Colorado State College of Education dealt with testing problems in the field of scientific attitudes, each taking one generalization such as open-mindedness, weighing evidence, sensitive curiosity, belief in cause and effect relations, and habit of delayed response.¹³

A number of detailed suggestions have been made on how to select a research problem. J. C. Almack¹⁴ of Leland Stanford University lists four procedures:

1. Analyze what is known, including the historical record;
2. Look for gaps or deficiencies in explanations—that is, for “areas of darkness”;
3. Watch for incongruities and contradictions, the points of controversy, the untested conclusions; and
4. Follow clues and suggestions obtained from reading, conferences, and thinking. Observe where activity is greatest, and where there is evidence of neglect. Keep a memorandum of ideas, hypotheses, and problems as they occur.

H. H. Abelson of the College of the City of New York has four suggestions. (1) “A highly stimulating source . . . is the *conflicts in experience* of one who is being educated, or who is observing and studying the process of education, or who is performing some type of education work.” (2) *Suggestions for needed research may be considered*. The last section in a well-written master’s thesis should list researches to be made by following investigators, which will round out a desired contribution in a specific field of problems. Note the many suggestions on further research in Kelly’s study of the arts college.¹⁵ (3) *Research work already completed*. Many abstracts, analyses, and lists of research reports are available, such as that by P. R. Franke and R. A. Davis at the University of Colorado.¹⁶ A number of these will be listed later. To the intelligent mind, these suggest other,

¹² E. U. Rugg, *Summary of Investigations Relating to Extra-Curricular Activities*. Colorado Teachers College Education Series. Greeley, Colo.: Colorado State Teachers College, 1930, No. 9.

¹³ F. E. Schnabel, *Construction of a Scale to Measure Objectively the Scientific Attitude, Openmindedness*, 1937; Lon Edwards, *Determination of a Scale for the Measurement of the Scientific Attitude of Sensitive Curiosity*, 1937; C. E. Bower, *Construction of an Objective Scale to Measure the Scientific Attitude Involving the Habit of Weighing Evidence*, 1937; R. F. Rutherford, *Construction of an Objective Scale to Measure the Scientific Attitude, Habit of Delayed Response*, 1937.

¹⁴ J. C. Almack, *Research and Thesis Writing*. Boston: Houghton Mifflin Company, 1930, p. 48.

¹⁵ F. J. Kelly, *The American Arts College*. New York: The Macmillan Company, 1925.

¹⁶ P. R. Franke and R. A. Davis, “Analysis of Scientific Investigations,” *Journal of Educational Research*, 23: 133-135, 1931.

related, and additional problems. (4) "A final source of ideas for research problems may be suggested by the obvious fact that needed research comprises *those problems left when from all the problems in the field of education, or a subdivision of it, are deducted the problems already solved*. Thus, to discover problems still requiring research, the field of education should be systematically outlined and summaries made of completed research."¹⁷ The agendum form, suggested for use in setting up the master's or doctor's research in Chapter V, will emphasize the outstanding importance of a critical analysis and evaluation of all pertinent previous research.

W. A. McCall of Teachers College, Columbia University, lists five ways to discover experimental problems:¹⁸

1. The best way to find genuine experimental problems is to become a scholar in one or more specialties as early as possible.

2. A second way to discover fruitful problems is to read, listen, and work critically and reflectively.

3. A third method of discovering fruitful problems is to consider every obstacle an opportunity for the exercise of ingenuity instead of an insuperable barrier.

4. A fourth method of finding problems is to start a research and watch problems bud out of it.

5. A fifth method of finding problems is not to lose those already found.

Carter Alexander of Teachers College, Columbia University, gives three methods to use in selecting problems in the field of educational administration:¹⁹

1. Acquire the attitude of questioning every administrative procedure in education, and inquire what evidence there is to support one procedure in preference to another.

2. Really know the most important fifty studies in educational administration.

3. Chart the issues which superintendents of schools must meet, list the kinds and amounts of knowledge, and estimate the reliability of the knowledge available.

A number of suggestions of researches needed and possible in the field of education have been made by experienced educationists. Very helpful statements are the annual reports of the presidents of the American Educational Research Association²⁰ and the proceedings of the annual meetings. These have called attention to necessary studies

¹⁷ H. H. Abelson, *The Art of Educational Research*. Yonkers: World Book Company, 1933, p. 18.

¹⁸ W. A. McCall, *How to Experiment in Education*. New York: The Macmillan Company, 1923, pp. 7-8.

¹⁹ Carter Alexander, *et al.*, *Educational Research*. New York: Bureau of Publications, Teachers College, Columbia University, 1927, pp. 2-6.

²⁰ M. R. Trabue, "Educational Research in 1925," *Journal of Educational*

of testing, the curriculum, remedial measures, retention, college enrollment, class size, buildings and equipment, finance, organization, and the like. Mead lists forty-eight problems that need solution in student teaching.²¹ Woody wants classroom teachers to attack their own teaching problems.²² Light and Smith see possible research activity in regard to class size, relative cost of annual and semiannual promotions, departmental teaching, kindergarten, validation of the curriculum, and industrial arts.²³ Lancaster has listed pertinent research problems in the field of teacher education.²⁴ Simpson gives eleven points of attack in the neglected field of educational finance:

1. The influence of depression cycles on school support.
2. The controversial status of state support provisions.
3. The safeguarding of school funds.
4. The efficiency of public works and school plot extension as a tool for unemployment relief.
5. The relation of education costs to business and industrial costs.
6. The technique of unit cost studies and the forecasting of costs.
7. The development of cost standards for plant operation and maintenance.
8. The effect of state minimum standards upon costs.
9. Business administrative processes.
10. The influence of tax and debt limitation and fiscal dependence upon the schools.
11. The influence of types of local administrative unit organization upon educational finance.²⁵

Research, 13: 336-344, 1926; Clifford Woody, "A Survey of Educational Research in 1923," *Journal of Educational Research*, 9: 357-381, 1924.

²¹ A. R. Mead, "List of Possible Studies and Researches in Supervised Student Teaching," *Educational Administration and Supervision*, 11: 355-358, 1925.

²² Clifford Woody, "The Values of Educational Research to Classroom Teachers," *Journal of Educational Research*, 26: 172-178, 1927.

²³ U. L. Light, "Muddling Through from Guess to Science," *Educational Review*, 68: 5-9, 1924; H. J. Smith, *One Thousand Problems in Industrial Education*. Minneapolis: University of Minnesota Press, 1931.

²⁴ J. H. Lancaster, "A Guide to the Literature on Education of Teachers," *Educational Administration and Supervision*, 29: 371, 1933.

²⁵ A. D. Simpson, "Needed Researches in Public-School Finance," *Proceedings*. Washington, D. C.: National Education Association, 1932, Vol. LXX, pp. 372, 373; L. E. Meece and N. F. Seay, *Financing Public Elementary and Secondary Education in Kentucky*. Lexington, Ky.: Bureau of School Service, University of Kentucky, 1939, Bulletin, Vol. XII, No. 1; P. R. Mort and F. G. Cornell, *Adaptability of Public School Systems*. New York: Columbia University Press, 1938; Educational Conference Board, Committee on State Aid, *An Improved System of State School Finance for New York*. Albany, N. Y.: New York State Teachers Association, 1940; G. M. Weller, *State Equalization*

Payne, Becker, and Lundberg²⁶ report on research projects in sociology. Symonds analyzes the field of research problems in personality and conduct.²⁷ Leonard and Good²⁸ suggest work in the teaching of English and in high-school methods, and the latter has a good analysis of the field of educational problems. Davis, Ballard, Jones, Gates,²⁹ and others have reported trends in research in the field of psychology. Personnel research is covered in such statements as Strang's, Bingham's, and Pence's, and in the bibliography of 2,183 titles published at Ohio State University, together with the mental measurement yearbooks from the School of Education at Rutgers University.³⁰

The problems of curriculum research are treated in such publications as those of Douglass, Symonds, Briggs,³¹ and others. Mead covers

of Capital Outlays for Public School Buildings. Educational Monograph, No. 11. Los Angeles: University of Southern California Press, 1940.

²⁶ E. G. Payne, "Research Problems and Trends in Educational Sociology," *Journal of Educational Research*, 25: 239-252, 1932; Howard Becker, "Space Apportioned Forty-Eight Topics in the *American Journal of Sociology*, 1895-1930," *American Journal of Sociology*, 38: 71-78, 1932; G. A. Lundberg, "Current Research Projects (Sociology): Report of Research Census of 1934," *American Journal of Sociology*, 40: 221-239, 1934.

²⁷ P. M. Symonds, *Diagnosing Personality and Conduct*. New York: D. Appleton-Century Company, 1932; "Needed Research in Diagnosing Personality and Conduct," *Journal of Educational Research*, 24: 175-187, 1931.

²⁸ S. A. Leonard, "Research in the Teaching of English," *Journal of Educational Research*, 19: 317-321, 1929; C. V. Good, "Research in Secondary School Methods," *Journal of Educational Research*, 22: 9-30, 1930; "Fields and Types of Research in Education, 1918-1931," *Journal of Educational Research*, 24: 34-43, 1931.

²⁹ R. A. Davis and C. R. Ballard, "The Development of Research in Learning," *Journal of Educational Psychology*, 23: 226-235, 1932; V. A. Jones, "Fields of Instruction and Research in Psychology as Represented by Members of the American Psychological Association," *Journal of General Psychology*, 10: 211-214, 1934; A. I. Gates, "Recent Advances in Educational Psychology," *School and Society*, 29: 1-8, 1929.

³⁰ Ruth Strang, "Trends in Educational Personnel Research," *Personnel Journal*, 10: 179-188, 1931; W. V. Bingham, "The Personnel Research Federation in 1930," *Personnel Journal*, 9: 250-259, 1930; O. E. Pence, "Personnel Research in the Y. M. C. A.; Progress on a Five-Year Program," *Personnel Journal*, 8: 375-383, 1930; W. H. Cowley, *The Personnel Bibliographical Index*. Columbus, Ohio: Ohio State University, 1932; O. K. Buros, Editor, *The Mental Measurements Yearbook*. New Brunswick, N. J.: Rutgers University Press, 1941.

³¹ H. R. Douglass, "The Contribution of Research to Secondary School Curriculum Construction," *School and Society*, 32: 411-416, 1930; P. M. Symonds, "The Contribution of Research to the Mental Hygiene Program for Schools," *School and Society*, 34: 39-49, 1931; T. H. Briggs, *Curriculum Problems*. New York: The Macmillan Company, 1926.

student-teaching research in two articles.³² Kindergarten research to 1930 is reported in *Childhood Education*,³³ and the Committee on Child Development of the National Research Council publishes six numbers annually of *Child Development Abstracts and Bibliography*.³⁴ Finally, some indication of the bulk³⁵ of reflective thinking in the general field of education may be had in the total number of book publications year by year. These are reported in March or April in *School and Society*,³⁶ up to 1942, when 750 titles were listed. In April, 1942, the *Journal of the National Education Association* published a selected annotated list of sixty books prepared in the Enoch Pratt Free Library, Baltimore, for the American Library Association. This resulted from "the scorings of more than three hundred specialists in various educational fields."³⁷ The year 1942 was the seventeenth in which the American Library Association had rendered this service.

Rather recently there has been an increase of interest in the problems of higher education. Kelly and Koos,³⁸ for example, suggest studies of methods of college instruction, college budget-making, the rating of college teachers, evaluation of the results of college teaching, and other questions arising there. Further, the *Junior College Journal* has a monthly bibliography for its field, continuing a United States Office of Education list³⁹ and including 4,345 titles. In Good's book and in many other publications,⁴⁰ suggestions for needed research in higher education are made.⁴¹

³² A. R. Mead, "Report of the Research Committee, the Supervisors of Student Teaching," *Educational Administration and Supervision*, 15: 385-388, 1929; and "Studies of Training-School Problems," *Educational Administration and Supervision*, 19: 152, 1922.

³³ Bessie L. Gambrell, et al., "International Kindergarten Union Research Committee: Report of Progress," *Childhood Education*, 6: 461-463, 1930.

³⁴ R. S. Woodworth, et al., *Child Development Abstracts and Bibliography*. Washington, D. C.: National Research Council, 10: 1936.

³⁵ M. M. Chambers, "Twenty Million Dollars' Worth of Educational Research," *School and Society*, 67: 273-276, 1948.

³⁶ J. L. Wheeler and Marion E. Hawes, "Educational Literature of 1940," *School and Society*, 53: 391-409, 1941.

³⁷ Enoch Pratt Free Library, "Sixty Educational Books of 1941," *Journal of the National Education Association*, 31: 123, 124, 1942.

³⁸ F. J. Kelly, "Scientific Method in College Administration and College Teaching," *School and Society*, 20: 390-396, 1924; L. V. Koos, "Research Problems in Collegiate Education," *School and Society*, 17: 169-174, 1923.

³⁹ W. C. Eells, *Bibliography on Junior Colleges*. Washington, D. C.: United States Office of Education, 1930, Bulletin, 1930, No. 2.

⁴⁰ C. V. Good, *Teaching in College and University*. Baltimore: Warwick and York, 1929; W. W. Carpenter, "Problems in Junior College Education," *Junior College Journal*, 5: 13-15, 1934; R. D. Colc, "A Plea for More Experimental Work by College Departments of Modern Foreign Languages," *School and Society*, 35: 501-503, 1932; G. W. Frasier and F. L. Whitney, *Teachers*

Memory and constructive imagination may be aided in this matter of locating a problem by an examination of reports of the titles of research investigations completed by other workers. One of the most valuable sources of information has been found to be lists of titles of masters' and doctors' studies already completed. First an examination of those of the institution where the student is in residence should be made, then of the latest lists from other research centers.⁴² One of the most inclusive reports of material of this kind, which goes back to 1919 and includes 1927, was issued in mimeograph book form by the College of Education of the University of Illinois.⁴³ This is organized so that the beginner may turn at once to the group of investigations in which he is most interested. The student should examine also such sources as Monroe's *Ten Years of Educational Research, 1918-1927*.⁴⁴ Recently, the library of the United States Office of Education has begun a collection of masters' and doctors' studies that are available for loan. As these are sent in, they are listed occasionally in the monthly issues of *School Life* and in special bulletins.⁴⁵

Reports of studies in progress are harder to find, but these are very helpful in aiding the beginner to locate his chief research interest.

College Finance. Colorado Teachers College Series, No. 10. Greeley, Colo.: Colorado State College of Education, 1930; V. A. C. Henmon, "The Function, Value, and Future of Educational Research in Colleges and Universities," *Journal of Educational Research*, 27: 493-502, 1934; Ida A. Jewett, "A Decade of Research in English in Teachers Colleges," *Teachers College Record*, 35: 460-472, 1934; C. W. Martin, "Problems of Higher Education as Found in Periodical Literature," *Peabody Journal of Education*, 9: 372-376, 1932; W. E. Uphaus, "Some Problem Areas in Higher Education," *Religious Education*, 26: 735-741, 1931; Luella Cole, *The Background for College Teaching*. New York: Farrar and Rinehart, 1940; E. V. Hollis, *Philanthropic Foundations and Higher Education*. New York: Columbia University Press, 1938; C. R. Sattgast, *The Administration of College and University Endowments*, Contributions to Education, No. 808. New York: Teachers College, Columbia University, 1940.

⁴¹ See Appendix IV, item 5.

⁴² Appendix I, "Samples of Reports of Doctors' and Masters' Studies from Institutions of Higher Education."

⁴³ W. S. Monroe, *Titles of Masters' and Doctors' Theses in Education Accepted by Colleges and Universities in the United States between January 1, 1919, and August 31, 1927*. Urbana, Ill.: College of Education, University of Illinois, 1921, 1925, 1927.

⁴⁴ W. S. Monroe, et al., *Ten Years of Educational Research, 1918-1927*, Bureau of Educational Research, Bulletin No. 42. Urbana, Ill.: University of Illinois, 1928.

⁴⁵ Ruth A. Gray, "Recent Theses," *School Life*, 26: 118, 1941, and current numbers; and *Doctors' Theses in Education: A List of 797 Theses Deposited with the Office of Education and Available for Loan*. Washington, D. C.: United States Office of Education, 1935, Pamphlet No. 60.

Every well-organized graduate office will have files of research studies begun, but not yet completed. *The Phi Delta Kappan*⁴⁶ has published such material, and many of the journals representing special fields list in each issue projects undertaken and in progress.⁴⁷ For many years, the *Journal of Educational Research* published a list of doctors' dissertations under way in the institutions of higher education. The last report, 1946, included 931 titles.⁴⁸ For a report of current research in education in the universities and fifty-three North Central publications see a recent issue of the *North Central Quarterly*.⁴⁹ Note the California Teachers Association listing of 364 theses and dissertations completed at four major California universities in 1947-1948.⁵⁰ Three fourths of these are masters' studies. One third of them deal with the school curriculum and with school supervision. Over one half of these studies were produced at Stanford University.

Continuing reports of research projects in specific fields⁵¹ may be

⁴⁶ Shelton Phelps, et al., "Research—Junior College Field," *Phi Delta Kappan*, 14: 200-202, 1932.

⁴⁷ Helen W. Atwater, editor, "Abstracts: Education," *Journal of Home Economics*; R. A. Baker, "Abstracts," *Journal of Chemical Education*; A. S. Barr, Chairman of Editorial Board, "Research Abstracts and Bibliographies," *Journal of Educational Research*; H. E. Buchholz, editor, *Journal of Educational Psychology*; L. L. Chism, "Educational Research and Statistics," *School and Society*; John Dewey and Carl Murchison, *The Journal of Social Psychology*; S. W. Fernberger, editor, *Journal of Experimental Psychology*; S. W. Hunter, editor, *Psychological Abstracts*; D. F. Jones, editor, *Genetics*; A. B. Lamb, editor, *Journal of the American Chemical Society*; Carl Murchison, editor, *Genetic Psychology Monographs* and *Journal of Genetic Psychology*; C. E. Palmer, editor, *Child Development Abstracts and Bibliography*; Joseph Peterson, editor, *Psychological Monographs*; F. K. Richtmyer, editor, *The Review of Scientific Instruments*; J. R. Schramm, editor, *Biological Abstracts*; J. T. Tate, editor, *The Physical Review*; J. B. Tharp, "Research and Methodology," *The Modern Language Journal*; F. M. Thrasher, editor, "Research Projects and Methods in Educational Sociology," *Journal of Educational Sociology*.

⁴⁸ C. V. Good, "Doctors' Theses Under Way in Education," *Journal of Educational Research*, 39: January, February, March, 1946.

⁴⁹ D. D. Henry, "The Expanding Role of Research in Education," *North Central Association Quarterly*, 23: 172-182, 1948.

⁵⁰ California Teachers Association, "Bibliography of 1947-48 Theses and Dissertations Completed at the Four Major California Universities," *Research Bulletin*, No. 4, 1948; R. C. Story, *Earned Degrees by Higher Educational Institutions*. Washington, D. C.: Office of Education, 1947-1948.

⁵¹ F. D. Curtis, *A Digest of Investigations in the Teaching of Science in the Elementary and Secondary Schools*, first, second, and third reports. Philadelphia: P. Blakiston's Sons and Company, 1926, 1931, 1939; R. L. Lyman, *Summary of Investigations Relating to Grammar, Language, and Composition*. Supplementing Educational Monographs, No. 36. Chicago: University of Chicago Press, 1929, and *The Enrichment of the English Curriculum*. Supplementing Educational Monographs, No. 39. Chicago: University of Chicago

found that will suggest similar studies, or may lead to the repetition⁵² of certain projects in another location, with other subjects, and with the use of better methods and techniques. The United States Office of Education began, in September, 1929, reports of educational research

TABLE VI
THE NUMBER OF RESEARCH STUDIES IN EIGHTEEN FIELDS OF
EDUCATION, 1939-1940^a

Fields	Doc- tors' theses	Mas- ters' theses	Theses re- ceived	Fac- ulty re- search	Fac- ulty stud- ies re- ceived	Total	Per cent (circa.)
1	2	3	4	5	6	7	8
1. Curriculum studies	199	1195	171	35	5	1605	35
2. Administration of schools	80	551	68	22	9	730	16
3. Testing and research	41	132	32	43	29	277	6
4. Teacher education	61	172	28	6	3	270	6
5. Secondary education and junior college	33	194	20	2	1	250	5
6. Educational theories	39	126	19	9	2	195	4
7. Higher education	37	107	24	14	4	186	4
8. Racial groups	15	110	32	3	1	161	4
9. Education	20	94	22	5	2	143	3
10. Elementary education	26	84	12	1	1	124	3
11. Exceptional groups	23	74	24	1	1	123	3
12. Current educational conditions, U. S.	12	80	5	5	1	103	2
13. Libraries	4	33	3	2	1	93	2
14. School buildings	4	73	6	1	.....	84	2
15. Educational sociology	19	30	25	2	1	77	2
16. Educational psychology	29	36	9	1	.....	75	2
17. Adult education	11	33	7	1	1	53	1
18. Current educational conditions, foreign	21	19	8	2	1	51	1
Total	674	3193	515	145	63	4590	

^a Ruth A. Gray, *Bibliography of Research Studies in Education, 1939-1940*, Washington, D. C.: Bulletin No. 5, 1941, United States Office of Education, 1941.

Press, 1932; W. S. Gray, *Summary of Investigations Relating to Reading*. Supplementing Educational Monographs, No. 28. Chicago: University of Chicago Press, 1925; "Summary of Reading Investigations," *Journal of Educational Research*, 34: 401-443, 1941; G. T. Buswell and C. H. Judd, *Summary of Educational Investigations in Arithmetic*. Supplementing Educational Monographs, No. 27. Chicago: University of Chicago Press, 1925; G. T. Buswell, "General Methods: Laboratory Experimentation," in F. N. Freeman, et al., *The Scientific Movement in Education*. Chicago: National Society for the Study of Education, 1938, Yearbook XXXVII, Part II, pp. 317, 318;

sent in from the field. These come largely from educational institutions, and include both student and faculty research. The first three list studies completed and those in progress, which is a very important and useful service.⁵³ Note that they begin with data for the school year, 1926-1927. Table VI distributes the items of the last report by eighteen subjects and by types. Note that the largest field of research reported is that of the curriculum. These reports were discontinued in 1941.

In Appendix II are given concrete suggestions of research problems by a number of educational leaders. These are organized in terms of the six segments of the total field of educational studies, the order being their probable rank in frequency, as suggested in Table VII.

C. The Definition of the Problem

After the research worker and his adviser have located what they consider to be a worth-while problem, a problem that can be safely undertaken with facilities available, the first level of its analysis will be in terms of its definition. This will serve to aid judgments on its value and its feasibility. If the problem can be successfully defined, it will take on an individuality that will make an attempt at its solution possible.

It will be recognized that this is the second step in the process of reflective thinking discussed in Chapter I. The true scientist does not stop with an indefinite feeling of deficiency and of need in the field of activity where he is at work. He proceeds at once to isolate from the total any points of difficulty that he recognizes. This is the beginning of actual reflective thinking.

What does the definition of the problem mean? Obviously it implies the separation of it from the complex of difficulties and needs that the thinking mind finds in any situation. *To define a problem* means to put a fence around it (Latin *fines*, boundaries), to separate it by careful distinctions from like questions found in related situa-

D. E. Scates, editor, *Review of Educational Research*. Washington, D. C.: American Educational Research Association, 1931-1941; L. V. Koos, editor, "Selected References," *School Review*; Newton Edwards, editor, "Selected References," *Elementary School Journal*.

⁵² F. L. Whitney, "The Need for the Repetition of Educational Experiments," *Teachers Journal and Abstract*, 5: 182-183, 1930.

⁵³ J. P. Woolcott, et al., *Bibliography of Research Studies in Education, 1926-1927*. Washington, D. C.: United States Bureau of Education, 1929, Bulletin, 1928, No. 22; Ruth A. Gray, *Bibliography of Research Studies in Education, 1939-1940*. Washington, D. C.: United States Office of Education, 1941, Bulletin, 1941, No. 5.

tions of need. W. S. Monroe and M. D. Engelhart give an excellent statement.

TABLE VII
RANK ORDER OF REPRESENTATION OF SIX SEGMENTS OF THE
TOTAL FIELD OF EDUCATIONAL PROBLEMS AMONG
7,159 STUDIES REPORTED, 1918-1927

Rank	Field	Frequency among		Total
		3,509 titles ^a	3,650 titles ^b	
1	2	3	4	5
1	The curriculum.....	479	235	714
2	Teacher education.....	225	49	274
3	Administration.....	242	15	257
4	Finance.....	74	142	216
5	Teaching.....	163	34	197
6	Supervision.....		38	38

^a W. S. Monroe, *Titles of Masters' and Doctors' Theses in Education Accepted by Colleges and Universities in the United States between January 1, 1919, and August 31, 1927*. Urbana, Ill.: College of Education, University of Illinois, 1921, 1925, 1927.

^b W. S. Monroe, *Ten Years of Educational Research, 1918-1927*. Bureau of Educational Research, Bulletin No. 42. Urbana, Ill.: University of Illinois, 1928.

To define a problem means to specify it in detail and with precision. Each question and subordinate question to be answered is to be specified. The limits of the investigation must be determined. Frequently, it is necessary to review previous studies in order to determine just what is to be done. Sometimes it is necessary to formulate the point of view or educational theory on which the investigation is to be based. If certain assumptions are made, they must be explicitly noted.⁵⁴

For example, a young school superintendent, newly arrived in a system of about 10,000 people, took office with a problem attitude toward everything.⁵⁵ One particular area of doubt pointed toward the length of educational experience that was provided for the children of the district. The school program included the traditional eight years of grades and four for high school. Should offerings be extended? If so, at which end? He discussed this informally with board members and

⁵⁴ W. S. Monroe and M. D. Engelhart, *The Techniques of Educational Research*. Urbana, Ill.: Bureau of Educational Research, University of Illinois, 1928, Bulletin No. 38, p. 14.

⁵⁵ F. L. Whitney, *Report of the Superintendent of Schools, 1916-1917*, Huron, South Dakota. Huron: Board of Education, 1917.

leading patrons, and finally came to a board meeting with this query: Should we organize kindergarten centers and a junior college in our district? This definitely limited the big area of uncertainty to one specific corner, and the board asked him to report first on the kindergarten problem in terms of a recommendation.

W. A. McCall of Teachers College, Columbia University, warns against the selection of either a too inclusive undefined problem or a question that is too narrowly limited.⁵⁶ It seems best, and is natural, to envisage at first the whole large field of inquiry in which the worker is interested. This should be quickly divided into its component related problems, and one of these selected for attack. The neophyte most often responds to a first opportunity to state his research problem by saying that he plans to "write" on a subject like *learning* or *high school methods* or *the course of study*, projects that would be as feasible as that of the sixth-grade boy who was assigned the composition topic, "War." But it is well to have a large, inclusive view of the whole field of problems, if at once analysis and subdivision are started so that projects possible of successful attack may be isolated. This analysis may be in terms of a long list of related subproblems kept in a notebook and added to, until perhaps one hundred or more appear, which the study might answer. Then these may be examined carefully for relative values. In fact, it may be worth while to rank the questions that have been listed in the order of their cruciality and feasibility. Go through first and check those of greater importance, on a two-point scale of lesser-greater. Then examine the *greater* list and underline the five or six of most importance, always keeping the ultimate aim of the whole process in mind. Then put in parentheses the question *par excellence*, the key query of the entire list, the real basic thing that the study is after. Of course, there must be constant judgments on the practicability of queries finally accepted. Any should be rejected whose attempted solution does not appear to be feasible at that time with abilities and resources available.

For example, the study outlined in agendum form in Chapter V might appear as follows at this point, just a few of the total list of questions being given.

VITAL QUESTIONS TO BE ANSWERED

11. What do primary grade teachers actually do in their reading classes?
22. What are the aims and purposes of teachers of primary reading?
63. (What is the relationship between the activity of primary reading

⁵⁶ W. A. McCall, *How to Experiment in Education*. New York: The Macmillan Company, 1923, pp. 7-8.

teachers on the job and the items of curriculum content to be included in their successful preparation?)

4. What are the personal characteristics of teachers of primary reading?
50. What standard tests do teachers of primary reading use?

8. What do nationally known reading specialists think about the preparation of primary reading teachers?

Notice that question sixty-three turns out to be the most inclusive and most highly important query of the entire list. It is the basic question involved in the investigation undertaken.

Now it will be recognized that the real problem statement in the thinking process engaged in during the carrying through of a piece of educational research is in the best form when it appears as a direct question. The crucial question appearing among all of those which the study *must* answer, that which really includes all others, is the problem involved. This should be carefully written at this point, so that it may be adequately evaluated.

To illustrate again with question sixty-three in this specific study, the problem may appear in this form:

PROBLEM

What are the specific items of preparation that should be offered in a well-organized teacher-education institution to prospective teachers of primary reading that will be closely related to the details of their future duties while teaching under contract and will insure a high level of professional success on the job?

In briefer form this may appear as follows:

What are the details of content for a college course offered to prepare prospective teachers of primary reading?

A beginner in educational research⁵⁷ attended a graduate research seminar one time and read a long list, such as that just suggested, as a part of his report of progress. The other members of the group made strenuous objection, saying that he could not possibly answer all of those questions in his investigation. "No," the dean replied, "he can't. But writing them out is a fine thing. It helps him to locate himself in the field of investigation he has chosen, and it gives him a better final judgment on the relative importance of things to be done and on which things he *must* do in order to come out successfully."

⁵⁷ F. L. Whitney, *The Prediction of Teaching Success*. Journal of Educational Research Monographs, No. 6. Bloomington, Ill.: Public School Publishing Company, 1924.

A young instructor in a teacher-education institution⁵⁸ was given charge of a course in professionalized mathematics for prospective high-school teachers. He was familiar with Randolph's general treatment of the problem and with his suggestions on how to professionalize subject matter. But, after handling groups of former high-school graduates for a number of quarters, with attempts to present aims and practices, give the history of the subject, examine textbooks, develop methods, analyze and make actual courses, study the psychology of mathematics, and so on, he recognized that there was still something lacking in his course, his teaching of it, the reaction of the student groups to it, and the outcomes that were attained.

Early in his experience, this general feeling of difficulties present became rather concrete and definite in a recognition that the precollege experience of the students had been deficient, or that they had forgotten. He suspected that they had not had an adequate mathematics background in the elementary and the secondary schools. Finally, the problem became more definite after a number of standard tests in arithmetic had been administered, because a surprisingly low level of achievement in the simpler arithmetical processes was revealed.

At this point, the instructor came under the tutelage of a senior member of the faculty, who acted as his adviser in the selection and prosecution of his master's study. Soon the teaching problem was clearly defined, and it was possible for him to recognize its implications from the point of view of his classroom practice and of its scientific investigation and solution as his master's problem leading to a higher degree.

A fine example of analysis of the problem area of the teacher-implementation study of the American Council on Education Commission on Teacher Education is given in this "brief statement."

What should be included among the basic objectives of teacher education? How may the teacher's total education, on both pre-service and in-service levels and with general or specialized emphases, best be planned and integrated?

How may the teacher gain effective understanding of child nature and the process of human development, together with competence in applying that understanding in relations with pupils and associates? How may the teacher grow in understanding and grasp of the social scene, in ability to share democratically in the life of the community, and in skill in fostering the local integration of school and community living? What first-hand experiences—with children, with professional associates, in society at large, through travel,

⁵⁸ H. W. Charlesworth, *A Study of the Subject-Matter Foundation of the Prospective Untrained Teacher of Arithmetic*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925; E. D. Randolph, *The Professional Treatment of Subject Matter*. Baltimore: Warwick and York, 1924.

and the like—ought to be included in the education of teachers and how should these be related to formal reading and the classroom experience? What creative opportunities through the arts ought to be part of teacher education and what is their relation to other aspects of the program?

How may candidates for teaching careers be more intelligently recruited and selected? How may guidance best be provided to aid teachers, again at both pre-service and in-service levels, in the attainment of an inclusive personal and professional adjustment? How may democratic procedures of administration be used in colleges and school systems to develop responsible personality? By what means, practice teaching or other experiences, may prospective teachers be most helpfully inducted into the profession? How may prospective and active teachers be most effectively stirred to take personal responsibility for their own continuous development and aided in planning to this end?

How may the activities of various types of institution and agency concerned with general and teacher education be more effectively articulated through cooperation? How may certification practices be improved? In what ways may superior individuals be attracted to the profession and made available to America's schools?⁵⁰

The solution of a research problem is a continuous process of reflective thinking, if skillful advice and guidance are available and the student mind is permitted to act and react naturally. And the first inevitable activity, after a need for change or improvement is recognized and the presence of a problem situation is established, is its limitation in careful direct-question form so that, as succeeding levels of thinking are reached, progress may be in terms of a well-conceived goal, definitely known.

The importance of an early, careful definition of the research problem cannot be exaggerated. It determines the philosophical background of the entire research, because the ultimate objective emerges from it (Chapter V). It concentrates and directs all research procedures. It makes more certain an arrival at a goal, an important generalization, which will contribute to the professionalization of the educational activities of the situation studied.

D. The Evaluation of the Problem

After a tentative problem, stated as a direct question, is selected, actual research work should not begin until a good judgment on its value is obtained.

W. C. Schluter of the University of Pennsylvania suggests six points of criticism:

⁵⁰ Karl W. Bigelow, *The Commission on Teacher Education: A Brief Statement of Its Origin and Scope*. Washington, D. C.: American Council on Education, 1940.

1. Does the field appeal to my interest?
 - a. Is the interest purely intellectual?
 - b. Is the interest present because of reward—pecuniary returns, possibility of advancement in position, increased authority, and so forth?
2. Are the results that may be obtained of practical or utilitarian significance?
 - a. May they be of use in business?
 - b. May they be of use to society, to government, or to others?
3. Does the field present gaps in verified knowledge which need to be filled?
4. Does the field require reworking?
5. Does the field permit extension of inquiry beyond the present limits of verified knowledge?
6. Is the field pivotal or strategical from the standpoint of the immediate purposes which the possible results of investigation are to serve?⁶⁰

Standards of evaluation for problems in the field of educational administration set up by Carter Alexander for Teachers College, Columbia University, are as follows:

1. Must be within the field of educational administration.
2. Must be unsolved, so that its solution will be a "contribution to education."
3. Must be real in the senses that its solution is a felt need and that it is capable of fairly definite solution based on adequate actual data.
4. Must make a worth-while or significant contribution to education.
 - a. Discover additional facts or new practices.
 - b. Substantiate questioned facts, theories, or practices.
 - c. Perfect a previously discovered technique.
5. Must be definite in that its conclusions may have real value.
6. Must be sufficiently limited to permit of exhaustive treatment.
7. Must be of sufficient value to justify the effort and time employed in the research.⁶¹

H. H. Abelson of the College of the City of New York would evaluate the problem question on two bases, that of personal suitability and that of social value.

CRITERIA OF PERSONAL SUITABILITY

1. Does the problem strike a respondent chord with respect to interest, without involving strong bias?
2. Is the problem, as a definite unit, feasible with respect to financial and administrative backing, time, and data required in its solution?

⁶⁰ W. C. Schluter, *How to Do Research Work*. New York: Prentice-Hall, Inc., 1927, pp. 11-12.

⁶¹ Carter Alexander, *et al.*, *Educational Research*. New York: Bureau of Publications, Teachers College, Columbia University, 1927.

3. Is the investigator equipped, or can he readily equip himself, with the general and specialized skills required in solving the problem?
4. Does the problem meet the personal purposes for which the individual has decided to undertake research? ⁶²

CRITERIA OF SOCIAL VALUE

1. How wide are the likely effects of the solution in terms of geographic area, number of persons reached, and duration of applicability?
2. How profound are the effects likely to be?
3. To what extent may the results of the study serve as a foundation for subsequent important research?
4. Is the solution of the problem likely to fill a gap or discrepancy in the organized body of educational knowledge?
5. Is the attempt at solution likely to be so qualified by the use of inadequately developed techniques or the application of unsubstantial assumptions that the conclusions will be of little or no value? ⁶³

In the standards given in Chapter XVI for the content of an educational research report, rubric 5 includes five items that suggest criteria to have in mind in making a definite decision on the value of a problem under consideration. ⁶⁴

1. Generalizations on a higher level of scientific thought, which take the form of: (a) hypotheses; (b) theories; (c) principles; (d) laws; (e) standards; (f) historical trends; and (g) prognoses.
2. New data presented or old information and materials organized into new forms and relationships with adequate interpretations.
3. Better methods in educational research, or the development of new techniques or the validation of old techniques, or their use in new fields.
4. New tools of precision for use in handling educational concepts.
5. Application of findings to concrete educational problems.

These twenty-seven suggestions on the value of the research problem are all pertinent and worth while. If they can be kept in mind as points of criticism, while the beginner in research and his adviser are making a final decision on just what project to undertake, fewer mistakes will be made that delay progress and make certain a final report of lesser or no importance.

A number of contrasting two-way decisions have to be made in considering a choice of a specific problem for ordered attack. (a) In

⁶² R. S. Lynd, *Knowledge for What?; The Place of Social Science in American Culture*. Princeton, N. J.: Princeton University Press, 1939, Chaps. V and VI.

⁶³ H. H. Abelson, *The Art of Educational Research*. Yonkers: World Book Company, 1933.

⁶⁴ F. L. Whitney, "The Evaluation of Educational Research," *School and Society*, 31: 289-290, 1930.

which of the two fields of human inquiry shall the project be found, that of *natural science* or that of the *social sciences*? The separation of point of view here is suggested in Chapter I, in the debate by F. S. Breed of the University of Chicago and Nathaniel Peffer,⁶⁵ Fellow of the Guggenheim Foundation in the Far East, on the possibility of a science of education. Whether the research thinker shall work as a social or as a natural scientist will depend no doubt on the bulk of his largest previous interest in academic course work, his educational activity, and actual research projects reported on. A possibility for continuance in either direction should be provided for in any academic or after-school location in which the individual finds himself. The one will include economics, sociology, history, human geography, and similar areas, together with the so-called education field, which envisages these as curriculum areas and deals also with the general problems of administration, supervision, and so on. The other is in the subfields of physics, chemistry, biology, and the like. The discussion of Chapter I seems to point out the fact that, in real reflective thinking, actual science work is possible in either of these areas of inquiry. The method of research in the social studies should be identical with thinking activities engaged in natural science research. Natural science research is the older field. Its procedures are more carefully organized. The expressions of amount used are better defined and more objective. The possibility of the emergence of respectable and valuable generalizations is more certain. But, after all, obvious contrasts found are only a matter of degree, as was pointed out in Chapter I. Some social science research is distinctly scientific and very worth while. It may be that some projects in biology or physics are of lesser value in method and results. The beginner, in making his selection, should be certain that whatever degree of ordered reflective thinking is possible in the research study he undertakes is definitely provided for and done. Then, although concrete results may be of lesser value, he will have illustrated a method and usable techniques and will have gained lasting personal benefit in his research experience.

Another decision that should be made is whether the project undertaken will be (b) *pure* or *practical* research. This distinction has been discussed in detail in Chapter I. Here, again, the research worker should be encouraged to continue in a field of problems in which he has found his previous interest and activity. It may be that the student goes directly on to the graduate level without any actual

⁶⁵ F. S. Breed, "Is a Science of Education Possible?" *Scientific Monthly*, 39: 530 ff, 1934; Nathaniel Peffer, "Educators Groping for the Stars," *Harper's Magazine*, 168: 230-238, 1934.

experience in the field of his choice, whether this be engineering, teaching, medicine, law, or other professional area. From one point of view, it may then be best for him to do reflective thinking in pure research without reference to human needs and social application. On the other hand, the selection of a "practical" problem related as directly as possible to his future life work may give insights and even some degree of actual skill and efficiency that may be carried over into after-college experience. For example, it is well known that a few outstanding present-day educators did not go into teaching, administration, or supervision under contract until after the attainment of a higher degree. Success under such a regime and program of preparation may be possible when there is a high degree of native intelligence, of desirable character traits, and of aptitude in the field entered.

Another decision that the student should make is, (c) shall my research project be very *specific*, concentrated into one small corner of a general field of problems, or shall I undertake a preliminary study of a large field with definite suggestions in the final report of related tasks for those who will follow in this *general* area of interest? Of course, one consideration of decision here will depend upon whether the big field in view is almost new with relatively few studies reported as yet. Chapter VII will advance the point of view that survey, or so-called "normative"⁶⁶ research, of this type is distinctly worth while and a great service in that it may open new fields of inquiry in preparation for more intensive study by following workers. Studies of this kind are characterized as "descriptive research," when the final report shows that the student has an inclusive knowledge and understanding of all related research and of the whole era of problems included, in terms of a detailed analysis and critical evaluative report of previous studies and definite outlined suggestions for further research.

A final decision that should be made is suggested by the question, (d) shall I attack a *new* problem, or shall I *repeat* a piece of research already reported? It may be assumed that the investigation should be new, in the sense that it has not already been solved finally for all time. But how many questions have been definitely settled in the field of the social studies or even among the natural sciences? There will not be much danger of doing over again something already reported in terms of ultimate truth. As was intimated in Chapter I, that goal is seldom, and perhaps never, reached in any field of human inquiry. Newness is a relative quality when applied to research problems, and it will probably be impossible to find any project in any

⁶⁶ J. C. Almack, *Research and Thesis Writing*. Boston: Houghton Mifflin Company, 1930.

field that has never been touched even by the periphery of reflective thinking.

Further, the student should not hesitate to repeat⁶⁷ researches already reported. These are never solved finally, as has been said, and the continuous attrition of reasoning may at last wear away the hard rock of ignorance if repeated contact is made at a specific point of doubt. The attack of the same tentative generalization reported by another worker in another field, with new subjects and material, with refined techniques, and by better methods is highly scientific. This is the invariable attitude among the outstanding natural scientists. A preliminary experiment is set up and reported on tentatively at the next convention. There the interest and cooperation of collaborators are secured, and the same project is carried through simultaneously by a number of experimenters. Results are compared at the next meeting of the group, and it may be that identical methods and techniques are used with the same problem many times for a number of years, before a brief paper is published in a technical journal. And it may be many years before generalizations obtained are judged to be worth including in a book report.

Many illustrations of this are well known in the field of natural science research. Among the social studies, it is not so easy to find specific examples. B. R. Buckingham, at that time director of the Bureau of Educational Research at Ohio State University, working under subvention by the Commonwealth Fund, made a study of teacher demand and supply in the State of Ohio. The purpose of the foundation was to stimulate similar studies in other states, using identical methods and techniques.⁶⁸ As these researches accumulate, highly worth-while generalizations ought to appear.

W. A. McCall of Teachers College, Columbia University, advocates a repetition of research projects for verification. He discriminates, however, between "ignorant repetition and conscious verification."⁶⁹

⁶⁷ F. L. Whitney, "The Need for the Repetition of Educational Experiments," *Teachers Journal and Abstract*, 5: 182-183, 1930.

⁶⁸ B. R. Buckingham, *Supply and Demand in Teacher Training*. Columbus, Ohio: Bureau of Educational Research Monographs. Ohio State University, 1926, No. 4; F. L. Whitney, *Teacher Demand and Supply in the Public Schools*. Colorado Teachers College Education Series. Greeley, Colo.: Colorado State College of Education, 1930, No. 8; E. W. Anderson and R. R. Foster, *Teacher Supply and Demand in Ohio, 1929-1930*. The Ohio State University Studies. Columbus: Bureau of Educational Research Monographs, Ohio State University, 1932, No. 11; R. L. Neagley, *Teacher Demand and Supply in the Public Schools of Pennsylvania*. Doctor's Thesis, Temple University, 1938; R. H. Eliassen and E. W. Anderson, "Investigations in Teacher Supply and Demand," *Educational Research Bulletin*, 27: 57-66, 83; 1948.

⁶⁹ W. A. McCall and G. J. Ruger, "Reliability of a Ph. D. Dissertation in

In evaluating a research problem for definite attack, good judgment should be obtained on its *feasibility*. Is it advisable to undertake the research project at this time and place with resources available for use? In particular, the graduate student about to select a problem that he can solve and report as partial fulfillment of requirements toward a higher degree should proceed with care and get the best specialist's advice he can, before he makes a final decision. It may be that he will discover, after using a large part of the total time permitted, that the task is impossible as planned. Cases are known in which this has delayed success and even prevented complete progress toward the sought-for degree.

Time cost should be estimated minutely, in the light of the judgment of the faculty adviser and knowledge of the experience of other students. For example, it is known in Colorado State College of Education that only about two thirds of all graduate students working toward the A. M. degree receive it after the normal time period of three quarters of resident work. Nearly one fourth of them use four quarters. In some cases, this may be caused by poor planning as to time cost. The problem of money cost is equally as important. A study of these items in a group of 147 masters' reports found central tendencies of 3.38 quarters and \$594 general expense plus \$52 for research.⁷⁰

It may be that solution of the problem is impossible because the student does not have control of the necessary techniques that should be used. An obvious necessity in studies that require the handling of objective data, expressed in terms of definite measures of amount, is a certain level of statistical skill.⁷¹ In many graduate centers, an elementary course in statistics is required. And in the case of vocational objectives like teaching, engineering, and the like, this is necessary in order that the technical journals may be read understandingly, although there are undoubtedly many research projects that deal with data on the upper levels of generalization, which are as yet more or less unmeasurable, in which only very little, if any, statistical skill is needed. The faculty adviser should be held responsible for a decision

Educational Psychology," *School and Society*, 7: 441-449, 1918; W. A. McCall, *How to Experiment in Education*. New York: The Macmillan Company, 1923.

⁷⁰ H. V. Allen, *The Cost of the Master's Education in a State Teachers College*, Unpublished Master of Arts Thesis, Colorado State Teachers College, 1933.

⁷¹ F. L. Whitney, *Statistics for Beginners in Education*. New York: D. Appleton-Century Company, 1929; E. U. Rugg, "What Education Terminology Should a Beginning Teacher Know?" *Educational Administration and Supervision*, 16: 187-195, 1930.

here. One student who was planning to set up a controlled experiment without having had a course either in statistics or in research methods was told to delay or to take another problem. Another student, who unhappily was permitted to carry to completion a research study requiring the making and use of a subject test, had to use another quarter, because he did not investigate statistically the reliability of obtained differences of achievement among controlled groups.⁷² The neophyte in research cannot expect to hoe his garden scientifically without any garden tool of any kind. Bare fingers will not work.

It may be that a specific research project is impossible now because needed tools of measurement are not available. This disability may be present in both areas of human inquiry, that of natural science and of social science. The former is an older discipline and has carried toward partial perfection more measuring instruments. The entities appearing there are also more objective and definite. But, after all, the difference is only a matter of degree. Reflective thinkers everywhere are faced with the problem of getting more and more useful micrometers, distance rulers, weight estimates, achievement and aptitude tests, index numbers, rating scales, score cards, questionnaires, character measurers, and the like.

A student working in the field wrote in to get advice on where to buy a commercially published pupil-achievement test. When told that any so-called standard test that he could buy could not be assumed to be valid in terms of the curriculum segment as used in his particular location, he found his research activities held up until he could learn how to make an instrument that would be valid, reliable, and inexpensive. This suggests that a research worker should probably not decide to avoid a field of activity in which the best tests are not available. He should go in and do the best he can. If this negative point of view had prevailed, we would still all be measuring weight by the so-many-stone unit and reporting pupil progress in terms of seventy-eight per cent in arithmetic. After developing the necessary knowledge of techniques, every scientist is obligated to make his contribution to the making, tryout, and perfection of tests, if the conditions of his research project require them. This remark applies, for example, to that area of subtle values and attitudes summed up under the words *character* or *emotion*. But many are entering this field recently, and it is probable that we have now advanced in the problem of character measurement to about where we were thirty years ago

⁷² J. D. Heilman, "The Misuse of Statistical Methods," *Teachers Journal and Abstract*, 5: 440-441, 1930.

in the making of tests in numbers and spelling. Some progress has been made, and more is possible.⁷³

It may be that a specific field and a group of subjects of adequate size and with the possibility of good control for the carrying through of a research project are not available. This fact should be determined early in the consideration of a proposed investigation. If the work on the agendum of objectives and procedures is begun at once, this and other points of feasibility will soon become clear. The thinker working under contract in the field has an ideal situation with respect to this. He is busy in his own laboratory. Not only his own pupils, but those of his fellow workers are available, if the administration has been careful to develop a scientific attitude among the staff. In this respect, the summer school student has an advantage over the worker enrolled for the usual academic year. He plans and sets up his research in detailed agendum form, and in connection with usual teaching, supervisory, and administrative duties carries it through to successful completion.⁷⁴

There are a number of other problems of feasibility that will occur to the thinking worker and that should be solved early in his experience with any project considered for attack. For example, it may not be possible to arrange conditions so that the law of the single variable⁷⁵ can be met, and for this reason an experiment under consideration must be given up. A preliminary survey may show that an adequate

⁷³ Winnie M. Thomas, *The Achievement in Character Education of the Young Citizens League of South Dakota*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931; A. L. Threlkeld and others, *Character Education*. Tenth Yearbook. Washington, D. C.: Department of Superintendence, National Education Association, 1932; R. W. Tyler, *et al.*, *Service Studies in Higher Education*, Bureau of Educational Research Monographs. Columbus, Ohio: Ohio State University, 1932, No. 15; F. L. Whitney, *et al.*, *The Classroom Teacher and Character Education*. Seventh Yearbook. Washington, D. C.: Department of Classroom Teachers, National Education Association, 1932; L. L. Thurstone and E. J. Chave, *The Measurement of Attitude*. Chicago: University of Chicago Press, 1929; Hugh Hartshorne, M. A. May, F. K. Shuttleworth, and J. B. Maller, *Studies in the Nature of Character*, 3 Vols.: *Studies in Deceit*, *Studies in Service and Self-Control*, and *Studies in the Organization of Character*. New York: The Macmillan Company, 1928-1930; D. A. Prescott, *Emotion and the Educational Process*. Washington, D. C.: Committee on the Relation of Emotion to the Educational Process, American Council on Education, 1938.

⁷⁴ E. H. Black, *The Socio-Economic Background and the Capabilities of Rural and Urban Youth*, Field Study No. 2. Unpublished Doctor's Field Study, Colorado State College of Education, 1940.

⁷⁵ May A. Burgess, "The Law of the Single Variable," *The Measurement of Silent Reading*. New York: Department of Education, Russell Sage Foundation, 1921, pp. 59-64.

sampling⁷⁰ of subjects and data is impossible in the field that the student desires to enter. In fact, every criterion for creditable, scientific research should be considered carefully in terms of the conditions and situation of the proposed project in order to determine its ultimate feasibility.

Most important of all, a judgment should be had on the general and specific research ability of the worker before he irrevocably pledges himself to the carrying through of a proposed investigation. In the case of the experimental research man in the field, he must prove his case to authorities responsible for the setting up of projects and their financing by a detailed statement of plans, methods, and techniques, the agenda. See, for example, the appendix in Kelly's report⁷¹ on the American arts college, which the Commonwealth Fund of New York financed. Associates in the carrying through of large projects, such as the National Survey of Teacher Education, are chosen very often from among students working toward higher degrees.⁷² It is assumed that they are under expert professional supervision by the local faculty and that it has been definitely ascertained that they are capable of going on.

In the case of the student working toward the doctor's degree, there is most often an adequate program of testing and checks of experience and personality that determine admission to candidacy. For the prospective master's student, these standards cannot be so severe. It may be that he should be permitted to start from near to the zero point of research experience and ability, the purpose being first of all to educate him in research methods and techniques rather than to scrutinize too closely the contribution he will make in his final report.

E. Summary

The research problem originates from a situation of need, where unsolved difficulties appear. If this need is felt, the thinking process

⁷⁰ G. A. Lundberg, *Social Research: A Study in Methods of Getting Data*. New York: Longmans, Green and Company, 1929; W. E. Spahr and R. J. Swenson, *Methods and Status of Scientific Research*. New York: Harper & Brothers, 1930, pp. 241-248.

⁷¹ F. J. Kelly, *The American Arts College*. New York: The Macmillan Company, 1925.

⁷² H. G. Blue, "Student Personnel—Prospective Teachers," *Teacher Personnel in the United States*. National Survey of the Education of Teachers. Washington, D. C.: United States Office of Education, 1935, Bulletin, 1933, No. 10, pp. 113-143; Catherine Kelly, *A Study of Representative Courses in Commerce in Selected Teachers Colleges and Normal Schools*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1932; and seven other theses on music, education, English, chemistry, modern languages, home economics, and history.

begins with the recognition of a definite problem. In making a selection of a specific problem for study, such activities as the following should be engaged in: analyze everything known already, all previous research; look for gaps in explanations; find untested conclusions; follow clues; recognize conflicts in experience; survey concrete suggestions for needed research; become a scholar in one or more specialties; read, listen, and work continuously and reflectively; consider obstacles challenges for ingenuity; start a research and watch problems bud out of it; have a constant attitude of questioning every procedure in the field of interest; look for actual evidence on current procedures; and estimate the reliability of knowledge available about important issues.

The problem should be carefully analyzed and defined so that all of its implications may be definitely apparent. This will reveal its limitations and make efforts toward solution more effective.

Evaluation of the problem should follow definition. This will reveal the intrinsic merits involved and will help form a final judgment on whether the thinking process should be carried further in a search for generalizations.

F. Research Exercises

1. Interview two educationists, one with a master's degree and one with a doctor's degree, and report on their personal experiences in finding their research problems.

2. What level of native intelligence is needed in order that a beginner in educational research may be able to transmute a *feeling* of need into a concrete, definitely delimited, and stated problem? Answer in terms of scores or I.Q.'s discovered.

3. If you find that no one has studied and answered question 2 on an objective level, how might you set up a research study to throw some light on it?

4. Should a neophyte in the field of education who says at the first conference with his research adviser, "I haven't any idea what I ought to write on. Can you tell me?" be refused admission to candidacy for a higher degree?

5. Interview by letter a half-dozen leaders in educational research, getting their judgment on the relative responsibility of the more experienced adviser and the beginner for the selection and definition of a research problem.

6. List three possible educational research problems that would be *valueless*, three *valuable* problems not *feasible*, three *valuable* problems not *possible*, and three problems at the same time *valuable*, *possible*, and *feasible*.

7. Illustrate the improbability of the immediate solution of one problem in the field of education because of the lack of good tools and instruments of precision.

8. Report on (a) the prescribed time and (b) the actual time used by each master of arts graduate in completing his required research study, using all graduates of the last five years in the institution you are attending.

9. Collect as much evidence as you can get on reasons for discrepancies found in the above report between the planned time for making the research study and the actual period of time used before it was finished.

10. Find and report a case of a beginner in educational research who started his investigation with absolutely no background of experience in the field of education. Give the details of his success in filling in the gaps.

11. Illustrate the fact that increase of ability to recognize problems parallels higher native intelligence.

12. Report on the preparation of students who take as their research projects the solution of problems coming out of previous professional experience.

13. Give examples of the repetition of research projects in the field of the natural sciences and in the field of the social sciences.

14. Make a score card for evaluating a proposed research problem, using as rubrics the items of evaluation discussed in this chapter.

15. Give examples of state planning for research on problems by state departments of education.⁷⁹

16. Find reports of educational research that include adequate analyses of the problem field entered.⁸⁰

17. Analyze the recently published critical inventory of the accomplishments of educational research and report the frequencies of mention of important problems.⁸¹

18. Analyze the problems attacked in nineteen research projects evaluated by the United States Office of Education and score them with the instrument made in 14 of this section.⁸²

⁷⁹ A. S. Barr, Editorial, "Educational Problem Solving," *Journal of Educational Research*, 32: 138, 1938; Department of Public Instruction, *Research Service in Education: Suggested Research Titles Pertaining to Education in Pennsylvania*. Harrisburg, Pa.: Department of Public Instruction, 1938, Circular 8.

⁸⁰ H. A. Brown, *Certain Basic Teacher-Education Policies and Their Development and Significance in a Selected State*. Contributions to Education No. 714. New York: Teachers College, Columbia University, 1937, p. 9.

⁸¹ W. S. Monroe, editor, *Encyclopedia of Educational Research*. New York: The Macmillan Company, 1941.

⁸² David Segel, "Educational Research Studies of National Scope or Significance," Chapter X in J. W. Studebaker, *Biennial Survey of Education in the United States, 1938-1940*. Washington, D. C.: United States Office of Education, 1942, Vol. I.

CHAPTER IV

The Evaluation of Previous Research

OUT OF A feeling of necessity, a definite problem has arisen; and the research worker is ready to proceed along the pathway of reflective thought to any possible goal of solution that can be conceived.

Obviously, the first procedure should consist of a careful determination of the progress human inquiry has made in the direction of the desired solution. The question is: at just what level and point on the scale of reflective thinking from no knowledge to complete universal knowledge does the student find the outpost of advance of investigation of the problem under attack? Below, very near the zero point of generalization, would be found the tentative research results of pioneer study. However, it is very probable that the student will not have to begin there. There are very few absolutely new problems now to be found in either the natural or the social fields of human inquiry. Far above, the ultima Thule of endeavor, is final complete truth. But however far up the scale the worker finds himself, he is never so near to this transcendent goal that there is nothing further to do. It is probable that there is no group of problems in any field of inquiry that has been completely and finally solved for all time. From little evidence and no conclusion to all the worth-while findings of all reputable scientists, research has brought the sum total of human knowledge up to a particular level of generalization. This point should be determined so that the new worker in the field can begin there and, standing on the shoulders of his predecessors, look ahead and spy out the best pathway for a new advance. Robert A. Millikan of the California Institute of Technology expresses this necessity.

Indeed, is not the main purpose of education to enable one to know the truth of the present, and to understand the truth of the past; in a word, to enable one to estimate correctly his own place and that of his contemporaries in the ever-expanding ocean of knowledge, for only with such understanding

can he shake off the inhibitions of the conventional, free himself from the emotional futility of the radical, and put forth constructive effort for the real betterment of the world? ¹

It is clear that vicarious as well as personal experience in reflective thinking should be had in the particular problem field to be entered. The student should think through every reflective process of every previous worker in the field of his interest, in order to get a direction and impetus that will insure good progress toward a similar goal. This means that he should find, analyze, and evaluate ² critically every pertinent research report dealing at all with his chosen problem. Anything less than this will be neither sensible nor scientific, because it will violate the known method of reflective thinking in good research. Further, he should know in detail about all related research projects *in progress* but not yet completed or reported. These have all of the items of value in setting up and carrying through his investigation that a finished study has, except actual final findings. Both furnish him with indispensable suggestions about comparative data, good procedures, likely methods, and tried techniques. They will also give concrete hints on how to organize the final report into logical chapter titles and section heads.

A. The Working Bibliography

It will be seen that this necessary orientation of the thinker at the beginning of his research will take form at last in his final report as (a) a list of evaluated titles, the selected, annotated bibliography, and (b) an adequately organized chapter or section near the beginning of the report, consisting of a critical analysis and evaluation of each of these research reports from the point of view of the ultimate objective of the investigation that he is making.

It will be recognized, however, that any attempt to catalog in time sequence, one after the other, the things to be done by the beginner in educational research, when he is organizing an investigation, cannot be entirely successful. And in fact, it has not been the purpose of the discussion to create the impression that it is at all necessary, if it were possible. The fact is that no such simple arrangement of the thinking process can be made. The mind does not work

¹ R. A. Millikan, *Evolution in Science and Religion*. New Haven: Yale University Press, 1929, p. 166.

² F. L. Whitney, "The Evaluation of Educational Research," *School and Society*, 31: 289-290, 1930; G. M. Wilson, "Research: Suggested Standards for Summarizing and Reporting Applied to Two Recent Summaries of Studies in Arithmetic," *Journal of Educational Research*, 28: 187-194, 1934.

that way, as Dewey explains in his illuminating statement.³ In the attack on a problem, the entire expeditionary force of the mind advances in phalanx, as it were. Or everything is going forward in extended order, by platoons, and in successive rushes, as opportunity and necessity dictate. Like Caesar in battle, everything has to be done at once.

This means that it is not assumed that the research worker has complete analytical knowledge of all thinking activities reported in the field of his problem at the very beginning of his work, before the problem is defined and evaluated. This would be expecting too much, even if he were a savant of world-wide importance. His check of studies in a general field of possible interest has undoubtedly been going on for years. This and every item of more recent knowledge he gets has guided his final choice of a feasible problem. It should be assumed that the student with the research attitude has been and is constantly making himself critically familiar with all of the available research in whatever field, wide or more intensive, that the situation of his location, his life activities, and his general or special interests suggest.

Another possible misconception should be refuted here. The new research worker naturally wants to do something as distinctive and worth while as possible, something new. Contrary to the attitude taken at times, it may be safely said that much knowledge does not hamper originality. As many data as can be obtained about all investigations in the field of endeavor where the research worker finds himself are absolutely essential to the successful carrying through of a process of scientific thinking in connection with a research study. This will not only furnish actual facts previously determined, which will constitute the basis of further study in the field of research, but will also give very valuable hints about desirable procedures, the details of methods to be employed, and suggestions on good ways to classify data, discuss and interpret findings, and finally report these conclusions properly, as has already been suggested. If the research worker is intelligent, these different types of information about the activities of previous investigators will stimulate him to use each bit of knowledge as a starting point for new and further progress. Buds of thought will burst out along the stem of reflection. Fine insights and hunches will appear. The research will be on a higher level of generalization, and more complete. It will be a further original contribution to the sum of knowledge in the situation investigated.

Knowledge of the thinking experience of others is gained most often through critical reading. The bibliography, then, becomes of supreme

³ John Dewey, *How We Think*. Boston: D. C. Heath and Company, 1933.

importance in beginning and carrying through a scientific investigation. The first thing to do is to examine what is already on hand, in the researcher's memory and in the files of his personal bibliography, in order to isolate items that are useful in a consideration of the problem undertaken. Happy is the beginner in research who has kept for years a well-organized, annotated bibliography in some definite form. If he has not, he should start at once, first filing all appropriate items that he can dig out of his memory.

The next step is to add new items that seem to be pertinent to the problem attacked. This, together with what is already on hand, constitutes the *working bibliography*. A high degree of persistency and industry are necessary here. Having the carefully defined problem constantly in mind, the worker must be as alert as a cottontail hunter, stalking swiftly forward with gun cocked, ready at the least movement behind any bush to pop over the bunny (book or journal item) as it appears! This is not a matter of specific time or place. The most successful hunter in this field carries constantly a few 3 by 5 inch cards and a pencil ready to bag every likely item that he thinks will have *any* reference to his task in hand. Something may come up in the classroom or when he is reading assignments for certain courses, or when looking over the new magazine shelf, or checking references in the card catalogue. As far as possible, all reading during the graduate years, when a definite research task is under way, should concentrate toward the problem of the research project in hand. At least a constantly alert attitude should be maintained, in all analysis of new literature, for pertinent reported data of probable value. Like Cecil Rhodes in his dreams of English colonization and a Cape-to-Cairo railroad, the student should constantly have in mind and be faced toward his "North,"⁴ so that any advance in knowledge made may be turned toward the direction of his research aim, if at all possible.

B. Research Reading

It will be recognized that, not only in locating and evaluating the problem (Chapter III), but also in analyzing all items of attitude and possible procedure (Chapter V), in collecting evidence on any hypothesis considered (Chapter VI)—in fact through every step of the process of reflective thinking—the matter of adequate reading ability is of supreme importance.

A recent book on reading emphasizes the necessity, in the learning

⁴ S. G. Millin, *Cecil Rhodes*. New York: Harper & Brothers, 1933; J. H. Hammond, *The Autobiography of John Hays Hammond*. New York: Farrar and Rinehart, 1935.

process, of recognizing two ways of thinking. There is reflection and learning for *discovery*. There is also thinking when *reading*. The latter is a vicarious mind activity, that which this chapter on previous research advocates as absolutely necessary before and during the research process, the attempt to discover through the Dewey-Kelley steps.

"The art of reading, in short, includes all the same skills that are involved in the art of discovery: keenness of observation, readily available memory, range of imagination, and, of course, a reason trained in analysis and reflection. Though in general the skills are the same, they may be differently employed in the two major types of learning."⁵

The problem of time cost in research has already been emphasized.⁶ Time is an essential element in the carrying through of the thinking project. In addition to any limitations set up by the faculty of the institution where the student is at work, there are the restrictions on time available arising from the total of all of his activities, as well as the time cost that he can bear in the light of his financial resources.

The problem, then, becomes that of placing silent reading performance on a level of optimum speed with maximum comprehension. It is perhaps surprising that there are such wide individual differences among adult research workers in this respect. But the fact is there, and the beginner should first of all find where he is placed on the curve. This is easily ascertained by means of an informal self-check or by a group test. Just select a book in the field of major interest, turn to a group of pages free from figures or other illustrative material, begin to read at a specified point, count the number of words read silently in three minutes, and reduce to a minute's time. Then, put the book aside and write out what can be remembered. The comprehension score will be the ratio of ideas in the original and in your reproduction. Norms for each of these scores can easily be obtained.⁷

If this difficulty analysis of reading ability reveals a deficiency in speed or in comprehension, the research beginner should do something about it. There is the case of one rather mature student who had lost

⁵ M. J. Adler, "Reading Is Learning," Chapter III in *How to Read a Book*. New York: Simon and Schuster, 1940, p. 43.

⁶ H. V. Allen, *The Cost of the Master's Education in a State Teachers College*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1933.

⁷ G. T. Buswell, *Remedial Reading at the College and Adult Levels*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1939, No. 50; W. B. Benton, "Speeding Up Our Reading," *Scientific Monthly*, 47: 261-263, 1938; George Stevens, editor, "Reading Time, One Minute," *Saturday Review of Literature*, 18: 8, 1938.

his power of comprehension in part. At the beginning of his graduate work, he abstracted carefully the three-volume *Educational Psychology* of E. L. Thorndike and regained his ability to read with understanding. Another individual found himself a slow, inner-speech silent reader. He began with primers, forcing himself to adequate speed, then used harder and harder material, until he was reading the literature necessary in the field of his study, and at a good rate. A recent informal report from A. K. Lauer of Iowa State College illustrates the possibility of self-improvement and estimates that the student may save at least seven hours each week by learning to read more rapidly. The contention is that the average student uses twenty to twenty-five hours per week in reading material that could be read with understanding in twelve to eighteen hours. This would be a waste of at least thirty-six days each year. The recommendation is that students keep their minds on the subject, see phrases instead of words, strive to comprehend paragraph units, read silently without making notes, relax occasionally, and summarize.

R. S. Lynd of Columbia University gives the following rules for gaining an increase in the speed of reading:

1. Force yourself for awhile to read more rapidly than feels comfortable. This is the most important rule of all. You will be bothered at first by not grasping the matter you are reading as well as is your wont. Disregard this and it will right itself with practice. An educator who has devoted considerable time to research into the problem of effective reading says, "I have considerably increased my own speed in reading by waking up to the fact that my rate was unnecessarily slow and then persistently reading as fast as possible with well concentrated attention, taking care to stop short of fatigue until the new pace was somewhat established."

2. Make as few stops or eye "fixations" in each line as possible. In reading, the eye moves not continuously, but by jerks and pauses. "The eyes take rapid glimpses or snapshots of successive portions of a line of print and then piece them together in obtaining the meaning." You do not read while your eye moves but when it stops. Do not read by syllables or even by words, but by groups of words, phrases, and sentences. Thus a poor reader who averaged 15.5 eye-pauses, or "fixations" per line of a given length decreased the number to 6.1 by a twenty-minute practice period each day for twenty days. Do you read a newspaper line with only three fixations? Do not fixate on the first word in a line but somewhere inside the beginning of the line; likewise make your last eye-pause in the line somewhere short of the end of the last word.

3. Do not allow the eye to break its forward sweep by wandering back in regressive movements to pick up something you have missed. You will have to guard especially against this at the outset when you are forcing yourself to read more rapidly. The most common cause of regression is a faulty hitting of the line when the eye sweeps back from the end of the preceding line.

Experiment with the most effective way to hit the lines of each type of subject matter you read.

4. Establish a regular rhythm of eye-movements adapted to the length of line and subject matter of each book you read. Feel yourself swing into each line with this rhythm. As Professor Buswell of the University of Chicago has pointed out, "In the eye-movement record of a mature reader it will be seen that the eye progresses across the lines with a rhythmic swing, making approximately the same number of fixations per line, with few or no backward movements. In contrast with this, the immature reader moves forward a few fixations, then backward to refixate upon some word that was not clearly recognized, then forward, and soon back again in the reverse direction."

5. Do not pronounce the words as you read or even allow your lips to move silently, as this slows up reading.⁸

A publication⁹ by W. B. Pitkin of Columbia University is worth examination and use by the beginner in educational research. It is written "strictly for the busy adult who is dissatisfied . . ." with his silent reading ability, and it provides good hints about how to improve word habits and eye grasp. The chapter on "How to Skim" is particularly suggestive. There are also over two dozen pages of exercises in so-called "solid," "heavy," "light," and "average" reading, but very probably the educational research worker will be able to find material among his own distinctive literature more useful for practice purposes.

Finally, the research worker should learn always to recognize differences in the objectives of the work type of reading that he must do. This is perhaps the matter of greatest importance. He cannot read everything that passes through his hands on the same level of care and at the same speed. There is not time enough. Furthermore, it is not desirable. Some of the material he examines should be read by title only, or in terms of chapter and section heads, including the preface. Some can be disposed of by reading the title and running the finger down the index at the back of the book. Some chapters should be skimmed very rapidly. Some need to be read slowly and carefully, notes being taken as progress is made. Some books and articles are to be laid aside for further mastery. Discrimination and good judgment here will not only save time, but will also be an index of the general intellectual ability of the research worker and a prophecy of his ultimate success in the task that he has undertaken.

A concrete example of discriminative skill in silent reading is fur-

⁸ R. S. Lynd, *You Have "More Time to Read."* New York: Alfred A. Knopf, 1928.

⁹ W. B. Pitkin, *The Art of Rapid Reading: A Book for People Who Want to Read Faster and More Accurately.* New York: McGraw-Hill Book Company, 1929.

nished by the practice of a leading American educator. In talking to an informal seminar group on this subject one evening, he said in substance:

In order to illustrate just what I mean about the necessity of the application of discriminating intelligence to our reading problem in graduate work, I am going to be personal.

You can perhaps recognize the fact that a man in my position has to read *everything* published in the field of education. Obviously, I cannot do this by the primary method of "line upon line," by slavishly going through every bit of sentence and paragraph discussion in every book, report, and journal article. I cannot do this even with the help I get from abstracts, reviews, and tabular reports that come from my paid helpers. But you will realize that, after many years of experience in this field of thought, quite a rich background of concepts is available, quite an *apperception mass*, as we used to call it, against which the interpretation of much of the so-called "new" material is easily accomplished.

I can read many new educational books in thirty minutes; some require longer; occasionally a section or a chapter of one must be carefully pondered over several hours, or even outlined or abstracted. But there is great duplication, much overlapping in current educational publications. Many of these can be adequately *read* by title or by chapter heads.

The task of this educator is no different in kind—and may not be much different in degree—from that of every earnest research student. He should *know* his field. This means not only desire and willingness, but actual skill in silent reading on a high level of speed and comprehension. See the list of 750 educational titles published in 1942 in *School and Society*, as reported in Chapter III. And note a former check of 144 journals in psychology, which yielded a grand total of over 2000 bibliographies.¹⁰ Evidently, not only speed and comprehension, but discriminative ability is required if the beginner in research is to orient himself among this mass of professional literature. For some judgment on every new item of publication has to be made in order for him to know whether to include it in the bibliography on which he is working.

In Appendix III will be found suggestions of available library research sources and aids. This material of the documentary type will be found in every well-stocked library. Much of it should be duplicated in the graduate office or seminar room of every educational institution offering academic and research work leading toward higher degrees. The student is referred for guidance to more complete man-

¹⁰ C. M. Louttit, "The Use of Bibliographies in Psychology," *Psychological Review*, 36: 341-347, 1929.

uals dealing with the field of education, such as those published at the University of Illinois and at Teachers College, Columbia University.¹¹

C. The Pertinent, Selected, Annotated Bibliography

As progress in the final definition and location of the problem of the research is made and a specific center of interest develops, work on the bibliography becomes more analytical and selective. If items are kept on filing cards, for example, the shift from the big pack of the working bibliography to the smaller number, the content of which bears more directly on the work being done, becomes more constant. The *pertinent, selected, annotated* bibliography begins to take shape. The final purpose is to have it come out in proper form as an appendix in the final typed or published report of the study. It will also become the basis for the content of the chapter or section on previous research in the final report.

The three italicized words above suggest desirable criteria for this final form. Every item in this list should be justified in terms of its close relationship to the investigation going forward. Just any title will not do. It must be *pertinent*. If it is a book, it may be that one chapter is referred to, a knowledge of the content of which is indispensable. If it is a magazine article, its subject matter should be pertinent to the objectives of the study in hand. Then, there are different levels of pertinency, and the word *selected* suggests that the annotated bibliography should be relatively short, as well as strictly to the point. However, no standard as to actual length can be set up. It may be that one report should include a final bibliography of one hundred titles, another six or eight. Obviously, just listing all of the footnote references of the final report will not yield this selected list of titles. Many of them may not be closely related to the ultimate aim of the research project in hand, and there will usually be titles other than those found in footnotes that should be included in the annotated bibliography. In addition to publications specifically pertinent to the study being made, many research students wish to in-

¹¹ W. S. Monroe, T. T. Hamilton, and V. T. Smith, *Locating Educational Information in Published Sources*. Urbana, Ill.: Bureau of Educational Research, University of Illinois, 1930, Bulletin No. 50; Carter Alexander, *How to Locate Educational Information and Data: A Text and Reference Book; Alexander Library Experiences; and Instructor's Manual*. New York: Bureau of Publications, Teachers College, Columbia University, 1941; Hilda Moehling and P. T. Rankin, "The Interpretation and Evaluation of Research," Chapter III in Myrtle H. Dahl, et al., *The Implications of Research for the Classroom Teacher*. Joint Yearbook, American Educational Research Association and Department of Classroom Teachers. Washington, D. C.: National Education Association, 1939, pp. 38-52.

clude a number of more general references that will furnish a measure of their complete grasp of the important literature of the field in which they are working. But these would not include statistics books, for example, or any other publications dealing with basic skills, which it should be assumed the student has.

The justification for the making of the *annotated* bibliography is simply that, following the usual pathway of scientific progress during the research undertaken, it is indispensable and at the same time an aid to and a record of progress made. The reason for its *inclusion* in the final report is threefold. In the first place, just to be "respectable" scientifically the research worker should report a well-organized bibliography in correct form and properly annotated. And of more importance is the fact that, as it appears in the appendix and as a critical section of the final report, it is an index of the control the beginner in research has of the entire field of literature pertinent to his study. Even the failure to put in just one item may be damning in this respect. For example, if one were working on the preschool and failed to include and carefully annotate the Twenty-Eighth Yearbook of the National Society for the Study of Education,¹² it would reveal a fatal lack, a sad deficiency in the professional grasp the student has of the research in his field of endeavor. But most important of all is the fact that the scientific reporter is obligated to aid in establishing a continuity of study and investigation in the research area in which he is working. Definite suggestions on this should be given in the last section discussion of the report, that on further research needed. And a highly useful thing is handed to the next student if the final bibliography is inclusive and well annotated.

It will be understood that the *annotation* for each item of the final bibliography will consist of a brief characterization of it or of that portion of the whole closely related to the central purpose of the research project undertaken. The final justification for the presence of any title in the list will be found in the annotation statement.

D. Summary

After the selection and definition of a problem for research endeavor, the worker should determine in an ordered manner just where he finds himself among the levels of generalization of reflective thinking with respect to the implications of the project that he is about to begin. This means a careful, critical analysis and evaluation of all reports of pertinent previous research in the field of his particular

¹² Lois H. Meek, *et al.*, *Preschool and Parental Education*. Chicago: National Society for the Study of Education, 1929, Yearbook XXVIII.

interest. It should include detailed knowledge of projects under way and not yet reported, as well as those completed.

The working bibliography includes all items of research information available from the worker's past experience in reading, course work, and research, as well as all new reports he can find, at all related to the problem under study. A high degree of reading ability is necessary for success in this wide canvass, the student being careful always to determine just the objective in view and to read toward that.

The final annotated bibliography should include carefully selected items pertinent to the central problem of the research. It should be indicative of the student's wide grasp of all thinking activity in the field of his research interest. Each item is evaluated, from this point of view, in terms of what is said in its annotation.

E. Research Exercises

1. Find illustrations among the scientists of the fact that "Much knowledge does not hamper originality."
2. Report on and justify the details of your method of keeping a bibliography.
3. State and illustrate the relative value of personal and vicarious research in the project you are beginning.
4. Report on the silent reading ability of the research group—class, seminar, or committee—of which you are a member, by tabulating the results of a reading test given by the instructor. Give comparative college and adult norms for rate and comprehension.
5. Write a description of your personal method of improving your reading ability, and report your progress in terms of speed and comprehension over a given time period.
6. Check and evaluate the annotations in a number of standard bibliographies. See Appendix III.
7. Examine the bibliographies in six masters' reports and in six standard educational books, and report judgments of them as to (a) form and (b) pertinency.
8. What use should the beginner in educational research make of his adviser in the matter of his working bibliography and his final pertinent annotated bibliography?
9. How may the annotated bibliography contribute to further research needed? Illustrate.
10. When should work on the bibliography begin? When should it end?
11. What is the relationship between the selected, annotated bibliography and the first chapter of the final report?
12. Show how this bibliography tells the research worker where to start

thinking among the levels of generalization found in the science-philosophy thought process.

13. What is the real function of the annotation of each item in the bibliography? Illustrate.

14. Cite outstanding illustrations of skillful reading, analysis, and evaluation of previous research reports, as a basis for further advance into the procedures of an educational research project.¹³

¹³ Harold Rugg, *That Men May Understand: An American in the Long Armistice*. New York: Doubleday, Doran and Company, 1941, Chapter X, "The Biography of Ideas," pp. 187-209.

CHAPTER V

The Agendum of Procedures

LET IT BE assumed that the research problem is rather definitely decided upon. It has been chosen out of the situation of negative feeling where need is recognized. It has been limited in terms of careful definition, so that it stands out as a separate unitary entity. In the light of wide and intensive critical analysis and evaluation of all research reports in the field of the problem, it has been tested, evaluated, and judged to be worth while and feasible.

Now an advance of expeditionary forces should be organized so that the territory of difficulty and doubt represented by the problem to be attacked may be entered effectively with reasonable assurance of ultimate victory. This is a process of mind activity, and it is obvious that the items of the plan of campaign should be listed in terms of the successive steps logically taken in ordered problem solving. It is the process of reflective thinking analyzed, illustrated, and interpreted in Chapter I. Economy of effort, material, energy, and time will best be served if the intellect of the research worker is permitted to act in this natural way. This will insure a steady and continuous progress, without false starts or retrogression, toward the goal set up.

A. The Logical and the Psychological Order

This psychological process analyzed by Dewey¹ and Kelley² in terms of six rather definite steps of progress, listed in Chapter I, toward higher, wider, and more worth-while generalizations may be restated logically as eight practical research procedures.

¹ John Dewey, *How We Think*. Boston: D. C. Heath and Company, 1933, p. 12.

² T. L. Kelley, *Scientific Method: Its Function in Research and in Education*. New York: The Macmillan Company, 1932, p. 5.

LOGICAL PROCEDURES IN A RESEARCH PROJECT

1. Feeling that there is an indefinite need.
2. Locating, defining, and evaluating the problem.
3. Deciding on the ultimate purpose, or objective, and writing it in definite form.
4. Selecting a tentative title, suggested by and closely related to the ultimate objective.
5. Setting down procedures, things to be done, in order that the ultimate goal set up may be reached.
- ✓ 6. Using the constructive imagination in writing the details of methods and techniques for each procedure.
7. Setting up the skeleton of the report in terms of chapter titles and section heads.
- ✓ 8. Writing the final report.

It is seen that this list of procedures is logical and that it conforms in substance to the accepted steps of the process of reflective thinking. One finds the drive for the project provided for (a) in the general feeling of difficulty and need which the research worker has at the beginning and which is repeated, augmented, and directed into the necessary channels of activity as the research study progresses. (b) The definition of the problem is there. (c) The guessed explanation, or hypothesis, takes the form of an ultimate objective. (d) Definite ways to get evidence on the value of this hypothesis are detailed among the research procedures, each with its methods and techniques stated. (e) Verification of the hypothesis and its deductive corroboration takes place. (f) The continued prognostic examination of the value of the concluding generalization is outlined and *may* be reported in proper chapter sections of the final report. In fact, if the researcher follows these eight procedures sincerely and expertly, he will be thinking reflectively; and he will be successful in his project, unless extraneous circumstances prevent.

The justification for this eightfold procedure is found in its agreement with the usual reasoning methods of the normal student mind. Perhaps the seventh step, the setting up of a tentative chapter plan, should be discussed. Is it futile, near the beginning of the project, to try to dig up out of a supposedly empty consciousness the critical big points of discussion and interpretation in the final report, together with as many details under each as possible? The answer is that the mind of the research student works that way. Even at the first level of a process of reflective thinking, his mind is not a *tabula rasa*, completely devoid of preconception, opinion, and ideas. He does not, as a rule, start at the zero point in the thought process. There is always some increment of past experience that immediately colors and directs the arrangement and interpretation of new evidence, even at the beginning of thought. The mind immediately says, "I believe it's this

way," and forms a more or less general concept at once. These *hunches* should not be lost. They should be recorded for what they are worth, if time is not to be wasted in research and the value of final results lessened.

A systematic record of these possible big points of interpretation results in definite chapter heads, and further constructive imagination and analysis suggest tentative section titles. The setting down of these does not hamper the thought process if the worker keeps an open mind and listens to each new increment of evidence at every level of advancement. It does not nip originality in the bud. On the contrary, it guides and consolidates reflective thinking and makes its final product come quicker and on a high level of value. It pays to begin the outline for the report *early* in the prosecution of a research study.

It will be recognized that the best suggestion for just what the chapter titles will be comes from the list of procedures provided for in step 5 as listed. The research report is a statement of experience in an ordered attack on the solution of a problem, and each thing done should obviously be told in detail. It will be seen, further, that the specific points of discussion in each chapter, the section heads, will be suggested first of all by methods followed and techniques used in carrying through each procedure (step 6). In fact, making the tentative outline for the final report is not a matter of pure guess at all. It is putting in logical and usable form the important points to guide the student when he sits down to write his final report.

B. The Agendum Form

Experience with many beginning research workers, as well as the known practices of leading reflective thinkers in the field, has proven the necessity for a carefully written outline of plans.³ This should be begun before the solution of a problem is attempted as a process of ordered reasoning. An illustration is found in the report of F. J. Kelly of the United States Office of Education to the Commonwealth Fund.⁴ Examples of student research outlines in the form they were handed to faculty advisers may be found in the files of any well-organized graduate office. For purposes of brief analysis and evaluation one of these follows. It is that of Pearl Merriman⁵ of the Washington State Normal School, Bellingham, Washington.

³ E. G. Blackstone, "How to Plan a Research Study," *National Business Education Quarterly*, 16: 8-14, 1946.

⁴ F. J. Kelly, *The American Arts College*. New York: The Macmillan Company, 1925, Appendix A, pp. 181-198.

⁵ Pearl Merriman, *The Professional Preparation of Teachers of Reading in the Primary Grades of the Public Schools*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1924.

AN AGENDUM OF PROCEDURES, METHODS, AND TECHNIQUES FOR A
RESEARCH PROJECT

The Professional Preparation of Teachers of Reading in the Primary Grades.

The Problem

What are the details of content for a college course offered to prepare prospective teachers of primary reading?

Ultimate Objectives

1. To find the relationship between the criterion for the professional preparation of teachers of primary reading (classroom activities, aims, principles, methods, measurement) and the items of preparation (actual and needed) discovered.
2. To make a recommendation for the revision of teachers college courses for the preparation of teachers of primary reading.

PROCEDURES

- I. Read and analyze critically the research literature in the field of inquiry.

METHODS AND TECHNIQUES

- I. Bibliography in tentative form.
(These are four of a total of twenty-eight items.)

1. M. L. Dougherty, *How to Teach Phonics*, Houghton Mifflin Company, 1923.

This is a very readable book giving a splendid discussion of the subject in general with practical suggestions for each of the first three grades. It should be a valuable book for every primary grade teacher, because it is free from the faddishness of some phonics systems.

2. W. S. Gray, *Remedial Cases in Reading: Their Diagnosis and Treatment*, Supplementary Educational Monographs, No. 22, University of Chicago Press, 1922.

Mr. Gray presents in great detail the results of the experiments in the diagnosis of reading defects and the devising of suitable

PROCEDURES

METHODS AND TECHNIQUES

remedial measures. The greater part of the work is devoted to a discussion of individual cases.

3. C. H. Judd, *Reading: Its Nature and Development*, Supplementary Educational Monographs, No. 10, University of Chicago Press, 1918.

The book contains a comprehensive study of eye movements. A rather detailed analysis of children's reading is made, with a study of their progress through the grades.

4. Paul Klappcr, *Teaching Children to Read*, D. Appleton-Century Company, 1922.

A summary is made of the various methods of teaching reading and a brief discussion given of the theoretical problems related to these methods. There is a brief review of the hygienic and physiology of reading. No new investigations are reported along any line. The book contains merely a review of what has been done before.

5.

n.

- II. Determine the activities of primary grade teachers in terms of what they are actually expected to teach in each of the primary grades.

- II. Informational analysis using twenty-five state and city courses of study.

1. *Colorado State Teachers College Course of Study for the Elementary Training School*, Greeley, Colorado, 1922.

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2. *Colorado State Course of Study in Education*, Denver, Colorado, 1921.
 3. *Course of Study for the Baltimore, Maryland, County School*, 1921.
 - 4.
 - n.

The reading content of courses of study will be analyzed to determine what is required of teachers of primary reading. Results will be put in tabular form. The items will be ranked in order of frequency of mention in the twenty-five courses.
- III. Determine the aims, psychological principles, and methods that primary teachers should understand in order to teach primary reading.
- III. An analysis of expert judgment will be made, using many books and magazine articles dealing with these topics. The Eighteenth and the Twenty-fourth Yearbooks of the National Society for the Study of Education will be included. The entire bibliography is very long and is not given here in complete form.
- IV. Trace the development of tests and measurements in primary reading and analyze the content of representative tests.
- IV. Bibliography used:
1. May A. Burgess, *A Scale for Measuring Ability in Silent Reading*, Russell Sage Foundation, 1921.
 2. W. S. Monroe, J. C. Voss, and F. C. Kelly, *Educational Tests and Measurements*, Houghton Mifflin Company, 1924.
 3. J. A. O'Brien, *Silent Reading*, The Macmillan Company, 1921.

PROCEDURES

- V. Determine in detail the preparation for teaching primary reading which teacher-education institutions are giving to prospective primary teachers.

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4. C. R. Stone, *Silent and Oral Reading*, Houghton Mifflin Company, 1922.
5. W. S. Gray and others, *Report of the National Committee on Reading*, Yearbook XXIV, Part I, National Society for the Study of Education, 1925.
6. The standard published primary reading tests.

V. Informational analysis.

More than twenty-five teachers college and normal school catalogues will be used.

1. *Colorado State Teachers College Catalog*, Greeley, 1924-25.
2. *Northern Arizona Normal School Bulletin*, Flagstaff, 1924-25.
3. State Teachers College and Junior College of San Diego, California, 1924-25.
4. *Lewiston State Normal School Bulletin*, Idaho, 1924-25.

5.
n.

From these catalogues, I am obtaining a statement of the courses offered that bear on primary methods in reading, psychology of reading, and testing in reading. Note is made of whether or not the courses are required, and whether it is a junior college or a senior college subject. The

PROCEDURES

METHODS AND TECHNIQUES

content of all courses is listed. From each institution I hope to obtain the names of the texts used in these courses. A review of those texts together with the catalogue statements will give some light on the type of preparation being given to teachers of primary reading.

A comparison will be drawn between the education which Colorado State Teachers College is giving to prospective teachers of primary reading and that being given by other similar institutions.

VI. Get the evaluation of a jury of specialists on the content of a teacher-preparation course for primary teachers.

VI. A jury of fourteen reading specialists will check a list of thirty-nine systematic books on reading in terms of their judgment on the best discussion of the following five criteria in their relation to the problem of the preparation of teachers of primary reading:

1. Objectives.
2. Psychology.
3. Oral presentation.
4. Silent reading.
5. Phonics.

VII. Classify the data.

VII. This will follow accepted methods of tabulation and graphic representation, such as are given in statistics books. The following twenty-five tables will probably be made, certain of the more general data being put into graphic form also as figures.

1. Frequency of the aims of primary reading.
2. Content of college courses

PROCEDURES

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in primary reading.

3.

25.

VIII. Discuss and interpret the material.

VIII. In accordance with the true meaning of each unit of data and with the problems discussed. Every group of facts in tabular or graphic form is to be:

1. *Discussed* to further the analysis begun in the table or figure, by calling attention to the table or figure by number or title and by mentioning important items and emphasizing certain sections.

2. *Interpreted* in order to disclose the true meaning and significance of each group of findings in terms of:

a. The general purpose of the research project.

b. The section and the chapter titles.

c. Specific recommendations to Colorado State Teachers College Curriculum Committee for the making of courses for the preparation of primary reading teachers for the public schools.

IX. Write the final report.

IX. Probable chapter heads and section topics.

PREFACE.

INTRODUCTION.

1. Statement of the Problem.

2. The Thesis.

3. Method of Attack.

4. Brief Summary of Findings.

PROCEDURES

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CHAPTER I. CURRICULUM
MAKING FOR TEACHERS OF
PRIMARY READING.

- A. Past Practices in Curriculum-making.
- B. Activity Analysis as a Method of Curriculum-making.
- C. Consulting "Frontier Thinkers."
- D. The Hypotheses on Which This Study is Based.
- E. Summary.

CHAPTER II. THE OBJECTIVES OF PRIMARY READING.

- A. Method of Arriving at Objectives.
- B. The Final List.
- C. Summary.

CHAPTER III. THE NATURE OF THE READING PROCESS.

- A. Characteristics of Reading.
- B. Eye-Movement Studies.
- C. The Fixation Pause.
- D. The Perceptual Span.
- E. Types of Reading Abilities and Difficulties.
- F. Summary.

CHAPTER IV. READING ACTIVITIES IN THE PRIMARY GRADES.

- A. Methods of Teaching Beginning Reading.
- B. Rate of Reading.
- C. Remedial Work.
- D. Summary.

CHAPTER V. THE DUTIES OF TEACHERS OF PRIMARY READING.

- A. Method of Analysis.
- B. Results of Informational Analysis.
- C. Summary.

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CHAPTER VI. TEACHER-EDUCATION OFFERINGS.

- A. Method of Analysis.
- B. Results of the Analysis.
- C. Summary.

CHAPTER VII. COLORADO STATE TEACHERS COLLEGE OFFERINGS.

CHAPTER VIII. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS.

- A. General Summary.
- B. Conclusions.
- C. Recommendations.
- D. Further Studies Needed.

ANNOTATED BIBLIOGRAPHY.

APPENDICES.

It is seen that the points of progress in actually attacking and carrying through the solution of the specific problem just outlined are, in general, in accord with the six steps of reflective thinking given in Chapter I and conform rather closely to the eight logical research procedures listed in this chapter. The essential elements of the analysis and plan are as follows. Feeling of need (1) is, of course, first and continuous.

4. The Title

2. The Problem

3. The Ultimate Objective

5. Procedures

6. Methods and Techniques

I.

II.

n, 8. Write the final report.

I.

II.

n, 7. Chapter titles and section heads.

I.

II.

III.

n.

It should not be assumed that the above outline is a *prescribed form* for every possible research project that might be set up in any field of inquiry. For example, as to *form*, it may be that the bifurcated.

arrangement of procedures and of methods and techniques may irritate the research worker. He may prefer to abandon this two-way plan, to have all bibliographic items full-page, and to write the details of methods and techniques following each statement of procedure.

This is a minor problem in the setting up of a research project. The essential is the necessity of making *some* definitely thought-out plan before investing energy, time, and money in a research study, so that there may be more probability of steady and uninterrupted progress toward a final solution well reported. It will be noted that although Kelly's agendum is not organized exactly in terms of the items that have been suggested, it includes the essential steps in the thinking process. Further, it is probably true that the various fields of human inquiry may need different arrangement of the details of the reasoning plan. This is illustrated in Chapter I in the analyses of reputable scientists, in both the natural and the social realms, of the essentials of the thinking process as found in science and research. For example, a rather general form of the agendum that is being successfully used in historical research follows. It is probable that distinctive listings of agendum steps might be given also for projects in pure science, sociology, controlled experimentation, curriculum-making, creative projects, and so on. The *sine qua non* is that some carefully organized preview be made of the field of future research activities in definite terms of things to be done, so that good progress, relatively free from mistakes, may be made.

AGENDUM FORM FOR HISTORICAL RESEARCH

Division of the Social Studies, Colorado State College of Education

- | | |
|-----------------------------|---|
| 1. The problem. | Here write out in simple language just what you propose to investigate. |
| a. Its statement. | Ultimately, this will become the title of your thesis. |
| b. Type of problem. | Here describe the kind of question you are investigating, whether in subject matter, in techniques of teaching, or whatever other angle of study you propose. |
| 2. Analysis of the problem. | Here state what you will need to find out to secure an answer to your question, the part that is already known, and the parts upon which new data will have to be gathered. |
| 3. Securing the data. | Here state in detail with reference to each section of your problem <i>how</i> |

and *where* you expect to find the data upon which a solution can be made. This will include printed materials of various kinds, personal interviews, experimentation, questionnaires, or any other means or combination of means that promises useful and relevant information. Where there are alternative methods of gathering data, state the advantages and disadvantages of each and your decision as to which you propose to use.

4. Manipulation and interpretation of data.

Here describe in detail, in connection with each section of your problem and the various kinds of information, how you propose to arrange your data, so that conclusions may be drawn from it. This includes a determination of your method of procedure. Some data can best be handled in statistical tables, some in graphs, diagrams, pictures, descriptions, historical narrative, or other forms adapted to the specific material in question.

5. Checking your data for reliability.

This may not be needed in all cases, but is usually necessary. Describe here how you propose to convince yourself and others that the facts you present are reliable and have been secured from dependable sources.

6. Writing the thesis.

- a. State what use you expect to be made of your results and who will probably read what you write. You will be expected to write your final draft for this proposed group of readers.
- b. Write out your probable chapter headings.

7. Probable rate of progress.

Here indicate about how much time you will need for each section of your study, when you propose to begin, and when you will need different sections in order to make regular progress in your study.

C. The Ultimate Objective and the Title

The attack on the solution of a selected problem is always in terms of an underlying, basic philosophy more or less consciously held by the research worker. This is the ultimate-ultimate objective, emphasized by Roscoe Pound⁶ of Harvard University. It is the determining point of view, the fundamental assumption that dictates which way the student shall face in advancing toward a desired goal of generalization. For example, in studying any public school problem, the usual philosophy includes universally held assumptions on the value of education in a democracy, the responsibility of all citizens for school support, and similar attitudes. At more or less remote times in the past, these concepts were, of course, matters of controversy; but general acceptance of supposedly good solutions, too often with a background only of tradition and no actual reflection, has forced every one in a given direction that no one except the extreme radical questions.

Conforming to the requirements of this basic assumption is the specific purpose of the particular investigation in hand, its ultimate aim. The necessity for a careful statement of this directing attitude is emphasized by E. R. Lankester. "Nature, it has been said, gives no reply to general inquiry. She must be interrogated by questions which already contain the answer she is to give; in other words, the observer can only observe that which he is led by hypothesis to look for; the experimenter can only obtain the result which his experiment is designed to obtain."⁷ Undirected, unthinking collection of facts is unscientific. Baconian induction should eventually yield to the direction of a specific purpose. Hypotheses must be considered.

It was seen (Chapter III) that the first step actually taken in the research project decided upon is a definite statement of the problem in direct question form and careful evaluation of it. In the making of the formal plan, this may be placed near the beginning of the agenda, as a guide for all following research activities.

It will be recognized that this question contains the concept of the actual aim or purpose of the investigation; and it has been found to

⁶ Roscoe Pound, "The Social Order and Modern Life," *The Creative Intelligence and Modern Life*. University of Colorado Centennial Series 1877-1927. Boulder, Colo.: University of Colorado, 1928, Vol. 5, pp. 94-163; R. S. Lynd, *Knowledge for What? The Place of Social Science in American Culture*. Princeton, N. J.: Princeton University Press, 1939, Chapter VI; D. E. Scates, "Types of Assumptions in Educational Research," *Journal of Educational Psychology*, 26: 350-366, 1935.

⁷ E. R. Lankester, *The Advancement of Science*. New York: The Macmillan Company, 1890.

help definite reflective thinking if this is transmuted to real ultimate objective form. This may be illustrated from the primary reading study already outlined.

Problem

What are the details of content for a college course offered to prepare prospective teachers of primary reading?

Ultimate Objective

To determine the details of content for a college course to prepare prospective teachers of primary reading?

It will be noted that in Section B the student has given a dual statement of final aim for her research. This is an illustration of rather confused thinking. There can be only one *ultimate* goal for any effort. One does not start out to drive to Omaha-Chicago. The final destination is Chicago. She has hinted at her big purpose in "2," and the transmuted problem question just given is a good brief form for it. What is given in "1" has to do with way stations on the road, proximate objectives, expressed as procedures in the agenda as given. She is obliged to determine these relationships between her criterion and the details of preparation, in order to be able to recommend the content for a professionalized course in primary reading.

Notice that it has been suggested that, after the problem and the ultimate objective are carefully written, the student is ready to state the title. It is natural for the beginner in research to tend to think of his research study first of all in terms of a rather definite title, worded as he thinks it will be when appearing at the head of his final report, because the title is the catch word, the slogan, for the ultimate objective which the mind naturally seeks first of all. He may say, "I intend to write on *Junior High School Reading*," for example. The mind readily attaches labels to ideas and concepts, so that they may be easily handled; but these always appear after a more or less conscious process of analysis and evaluation of the situation of experience. Stating the ultimate objective provides the beginning of this analysis and makes possible the first best guess about what the title of the study will be. However, it should be said that one cannot be certain of the final statement of the title until further progress is made along the pathway of research procedures planned out. New implications of the real direction of progress may change the working conception of the ultimate purpose of the investigation, and these will necessitate changes in the wording of the title.

The necessity and value of careful faculty advice seems apparent here. Just as soon as possible in the research experience with the proposed project the actual big aim should be finally determined,

otherwise energy, time, and funds may be wasted. One student in a certain institution of higher education began his research study with a guessed ultimate objective that seemed to point, as it were, toward the north as the direction of effort. But, as the result of more study and analysis of previous research and careful thinking, it soon became apparent that the research pathway might be north by northeast; and after nearly a year of inexpert groping with little direct help from his adviser, he concluded that he should proceed in an easterly direction, if he was ultimately to reach his goal of reflective thought. The result was that the time cost for his doctor's research was two years, when it might have been completed after a possible twelve months of work.

D. Procedures, Methods, and Techniques

Attention has been called in the preceding section to the obvious necessity for a detailed decision on the intermediate steps to be taken in progress toward the final goal of the research project. In the going from Denver to Chicago, shall the route be through Omaha and Clinton by the Lincoln Highway? Or shall one drive over the south trail through Lincoln, St. Joseph, and Hannibal? Or shall another direction be taken? The proximate objectives of the total research effort should be stated now as carefully conceived procedures. These decisions require very careful consideration, the exercise of a high degree of constructive imagination, industry, perseverance, patience, and time. The suggestion is that, as soon as any tentative decisions in the matter are made, they be reduced to writing at once and then be subjected to constant revision, as new light appears on the details of proper procedures. In this way no progress once made will be lost. It will not be necessary to go back to the zero point every time the task appears above the level of conscious thought. It may be taken up at the stage of progress already reached and shoved ahead nearer to the final successful arrangement as a definite list of necessary research procedures.

Referring again to the illustrative study already considered, it will be seen that at the end of ten weeks of work the procedures more or less definitely decided on were:

- I. Read and analyze critically the research literature in the field of inquiry.

- II. Determine the activities of primary grade teachers in terms of what they are actually expected to teach in each of the primary grades.

- III. Determine the aims, psychological principles, and methods that primary teachers should understand in order to teach primary reading.

- IV. Trace the development of tests and measurements in primary reading and analyze the content of representative tests.

V. Determine in detail the preparation for teaching primary reading that teacher-education institutions are giving to prospective primary teachers.

VI. Get the evaluation of a jury of specialists on the content of a teacher-preparation course for primary teachers.

VII. Classify the data.

VIII. Discuss and interpret the material.

IX. Write the report.

The list of procedures gives the best guess on *what* must be done in the carrying through of the study engaged in by the research beginner. But he should decide in minute detail just *how* he plans to do each thing that must be done and *with what* he will do it. He should settle on all of the methods for each item of procedure and the actual tools (techniques) to be used at each step taken toward the final goal of completion, the ultimate objective. And in this the worker cannot be too scrupulously careful, too industrious in cudgeling his brain about the least detail of technique, too meticulous in writing down every last item of "*how*" of which he can get preknowledge and in selecting and listing "*with what*." A mistake here may cost money, and always will cost time. For each item of procedure a careful answer should be devised and set down to the question: just what should I do at this point to make certain and valuable the step decided upon?

Too much space in the agenda cannot be given to these answers. The sample outline given in this section may be justly criticized in that its "Methods and Techniques" statements are too short, leave too much unsaid. But it will be remembered that this was written after only ten weeks of work. Thinking did not stop at this point of progress. If the outline were written out again during the third quarter of work, it would include more and possibly *all* necessary details.

Taking an illustration from this agenda, it will be seen that procedure III, "Determine the aims, psychological principles, and methods that primary teachers should understand in order to teach primary reading," is followed by this tentative list of methods:

An analysis of expert opinion will be made, using many books and magazine articles dealing with these topics. The Eighteenth and the Twenty-fourth Yearbooks of the National Society for the Study of Education will be included. The entire bibliography is very long, and is not given here in complete form.

It will be seen (a) that at least a better sample (possibly a dozen items) of the bibliography to be used for informational analysis should have been given; (b) that the details of the method of analysis (techniques) ought to have been explained and illustrated; (c) that necessary differences in techniques used for the analyses of *aims*, *principles*,

and *methods* ought to have been explained; and so on. In fact, the actual details of every item of method and technique should be given here. They will all appear as research activities later during the carrying out of the study, and their statement at this point will make certain that every item of procedure shall be done in logical and psychological order, and none be omitted.

E. Chapter Titles and Section Heads

Experience and knowledge of the psychology of thinking have shown that it is a very valuable thing and strictly in accord with the way the normal mind insists upon working (Section A), to write down just at this point the first guess as to what the big centers of discussion will be in the final report, together with whatever can be thought out for detailed topics under each. These are the chapter titles and the section topics of the completed report.

If the necessary *procedures* have been carefully set down, as suggested, the research student will find there the best hint for the organization of a logical trend of thought in the final report of his study, the best suggestion on the content of the several chapters that are to be written. It is not suggested that it is always possible actually to restate each procedure in title form and to be certain that one has an outline of chapter titles for his report. This sometimes occurs; but often, too, it does not. It may be that two of the procedures are so closely related that their content should appear as a logical unit of discussion in a single chapter. Or, it may be that under another procedure two or three vital techniques of attack appear on the "Methods and Techniques" side that should each be given a chapter.

This suggests a likely source of information for the subsumed points of discussion in each chapter, the section heads. These may be looked for first of all among the parallel methods and techniques statements to the right. If these are very carefully thought out and minutely written in, one may have hints on all that needs to be said in each chapter discussion.

Notice, in the agendum given, under the Methods and Techniques of procedure IX (Section B), that the section heads are very well thought out, except for Chapter VII. The imagination balked there, and it was probably better after all to wait for the actual analysis of the courses offered to decide on the proper points of discussion and interpretation.

Notice that the chapter titles, except the last, are *distinctively* stated. They are not simply:

CHAPTER I. INTRODUCTION

CHAPTER II. METHODS

CHAPTER III. RESULTS

CHAPTER IV. SUMMARY AND CONCLUSIONS

It is true that reports of investigations organized in this manner may be found in the libraries. But these chapter titles suggest nothing about the *content* of the report, and that is just what they should do. They should be *distinctive*. There are always several big logical units to be found among the materials resulting from the study, and these will appear as chapter titles. If the beginner's imagination cannot guess these at all so early in the research, he may get hints as to what they will be by examining reports of investigations similar to his written by other workers. These may almost always be easily found. Hardly any research neophyte is at work in a virgin field.

Exceptions to this point of view may occur in the titles of the first and the last chapters of the report. It is noticed that the title for Chapter VIII of the *agendum* is *Summary, Conclusions, and Recommendations*; and this is very good. Likewise, successful reports often organize the first chapter as follows:

CHAPTER I. INTRODUCTION

- A. Previous Studies in the Field.
- B. The Need for This Investigation.
- C. The Problem.
- D. The Thesis.
- E. Procedures and Techniques.
- F. Brief Summary of Findings.

The last section above is very hard to write, but it is very useful. It is section A of Chapter VIII, for example, "General Summary," reduced to its smallest possible bulk, possibly one paragraph. The writing of these two sections, certainly a section like section A in the last chapter, which is the big, detailed summary of the entire study, is an obligation on the part of the research worker. He should put all of the details (background, methods, results, conclusions, and so on) somewhere in condensed form so that the busy student of education may be able to get it with the least expenditure of time. The last chapter is the logical place for this, unless one uses an entire *first* chapter for this purpose, as is done in many survey research reports that are written, for example, to get over a series of recommendations to a legislature or other body with authority.⁸

⁸ Paul Monroe, *A Survey of the Public Educational System of Porto Rico*. New York: Bureau of Publications, Teachers College, Columbia University, 1926; A. O. Colvin, *Commercial Education in the Secondary Schools of Colo-*

Comment should be made also on the last suggested section of the last chapter, "Further Research Needed." The research worker should begin to keep notes for the writing of this section as soon as he begins his planning. If his mind works with fertility, many side problems will be constantly budding out of the main stem of thought growth. These are suggestions for other related studies that ought to be undertaken, if a complete, inclusive investigation is to be carried through in the field of endeavor. All of these that cannot be made by the research worker himself at this time should be carefully listed and briefly discussed in the last section of his report. This is a test of his grasp of the whole question, and it insures continuity in research by telling the next student what following things should be done. Note that Kelly in his Commonwealth Fund study⁹ gives these suggestions on important related researches that should be made throughout his entire report, listing them after each important unit of discussion instead of grouping them all under a single heading at the close of the book.

F. Summary

The carefully organized outline plan for a research project, the agenda, should be made in accordance with the usual natural mind activity of the student—that is, in terms of the psychological steps in the process of reflective thinking. These may be stated logically as eight practical research procedures that have been found to be effective in the actual research experience of many problem solvers. They appear in the agenda as problem, ultimate aim, title, thesis, procedures, methods, and techniques.

G. Research Exercises

1. Analyze a master's report in terms of (a) problem, (b) ultimate objective, (c) title, (d) thesis, (e) procedures, each with its (f) methods and (g) techniques.
2. Analyze a doctor's dissertation in the same way.
3. Analyze a research made in some field other than the social sciences in the same way. For example, take one found in the Engineering Foundation narratives, in *Microbe Hunters*, or in Pasteur's biography.¹⁰

rado. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1929.

⁹ F. J. Kelly, *The American Arts College*. New York: The Macmillan Company, 1925, pp. 150, 151.

¹⁰ A. D. Flinn, editor, *Popular Research Narratives*. Baltimore: Williams and Wilkins Company, 1924-1929; P. H. DeKruif, *Microbe Hunters*. New

4. Make a score card for the evaluation of the report of an investigation in the field of educational research, using for the main items of the scale the points of discussion in the preceding sections and including also the bibliography treated in Chapter IV.¹¹

5. Interview an educator who has a master's degree and make a list of the items of his experience in planning and making the research study offered in partial fulfillment of the requirements for his degree.

6. Interview a doctor of philosophy in the same manner.

7. Analyze five reports of masters' studies and judge them as to whether the chapter and section titles are arranged both logically and psychologically.

8. Analyze five doctors' dissertations in the same manner.

9. Get definitely stated criteria for a good title for a research report from the head librarian and analyze and evaluate five titles of reports found in the educational journals, five book titles, and five titles of masters' reports.

10. Organize an agenda for the investigation of a problem found in the field of your proposed research interest, but other than your thesis project. The following topics may be suggestive:

(a) The distribution of state school funds in the state of your residence.

(b) The relation between scholarship and the amount of money spent per capita.

(c) A comparison of the relative value of extensive and intensive procedure in teaching literature.

(d) Elements that produce success in arithmetic.

(e) The relative efficiency of comprehension and retention of information presented in fact and story form.

(f) The growth of Dutch Colonial schools in New York.

(g) The preparation of teachers of high-school English.

(h) The relative difficulty of arithmetical combinations.

11. What research problems do you see in the following situations? Organize each study found in terms of title, objective, and procedures with methods and techniques to be used.

(a) You are superintendent of schools in a small city like Longmont, Colorado. A number of your patrons believe that the secondary school curriculum should be extended for two years beyond the twelfth grade and organized as a local junior college. They have interested the chamber of commerce to request the board of education to do this. The chamber of commerce has heard that Trinidad has a junior college. The board of education asks you for a report and recommendations in the matter.¹²

York: Harcourt, Brace and Company, 1926; René Vallery-Radot, *The Life of Pasteur*. New York: Doubleday, Doran and Company, 1923.

¹¹ A. R. Mead, V. A. Hines, Ida R. McLendon, "Proposals to the American Educational Research Association for the Improvement of Educational Research," *School and Society*, 67: 160-163, 1948.

¹² F. L. Whitney, *The Junior College in America*, Colorado Teachers College Education Series. Greeley, Colo.: Colorado State Teachers College, 1928, No. 5; W. C. Eells, *The Junior College*. Boston: Houghton Mifflin Company, 1931.

(b) You are an elementary school supervisor in a city system of about 7,000 pupils. The superintendent of schools has just returned from a national meeting where he has heard a number of addresses on preschool education. He asks you what it is all about and what you recommend for the local system.¹³

(c) You are director of research in a school system in a city of about 300,000 population. You have reported to the superintendent a pupil-unit cost in the elementary schools that is much higher than that in ten other cities of about the same size. He asks you to make a study of class size in the elementary schools. He wishes to know whether he may lower pupil-unit costs by increasing class enrollment, and without lowering the efficiency of public education in the local system.¹⁴

(d) You are a biology teacher in a teachers college. You make certain definite daily reading assignments to your freshman class, but the majority of the students come back day after day knowing very little about what they have read, and in the final test their residuum of information is meager indeed.¹⁵

(e) You are a young master-of-arts graduate from a teachers college just elected to the principalship of a junior-senior high school of 350 pupils. Your new superintendent asks your judgment on the desirability of changing the daily program of the high school to have lengthened periods (80) minutes instead of 45-minute periods as at present.¹⁶

¹³ Lois H. Meek, *et al.*, *Preschool and Parental Education*. Washington, D. C.: National Society for the Study of Education, 1929, Yearbook XXXVIII.

¹⁴ F. L. Whitney, "The Relation of Class Size to School Efficiency in the Primary School," Chapter III in *The Child and His Teacher*. Second Yearbook, Department of Classroom Teachers. Washington, D. C.: National Education Association, 1927, p. 163; F. L. Whitney and G. S. Willey, "Advantages of Small Classes," *School Executives Magazine*, 51: 504-506, 1932.

¹⁵ L. C. Pressey, "A Class of Probation Students," in S. L. Pressey, *et al.*, *Research Adventures in University Teaching*. Bloomington, Ill.: Public School Publishing Company, 1927, pp. 11-21.

¹⁶ L. V. Koos and O. L. Troxel, "A Comparison of Teaching Procedures in Short and Long Class Periods," *School Review*, 35: 340-353, 1927; G. E. Denman and T. J. Kerby, "The Length of Period and Pupil Achievement in High School," *School Review*, 41: 284-289, 1933.

CHAPTER VI

The Collection of Evidence

THE THINKING process requires at every stage of progress added increments of evidence in order that inferences, hypotheses, or theories tentatively held may be identified as valid, verified as correct, or rejected as untenable. Even the beginner in research recognizes this necessity, and his first impulse is to prepare immediately to "send out a questionnaire." More information about the status of the situation of the research and about the action of variables there operating must be obtained, otherwise no contribution will be made toward generalization, no scientific discovery will result from research. In fact, data have to be collected.¹

A. The Basic Need

In the necessary thinking processes of (a) the accumulation of pertinent data and (b) their classification so that they may be adequately discussed and interpreted in terms of worth-while generalization, the basic importance of the former mind activity cannot be over-emphasized. The popular jeer at the pseudo-scientific academician, the Ph.D.-let, that he knows more and more about less and less, calls attention to this. There is danger in the getting of central tendencies, spread measures, and relationships (Chapter XV), that these activities will be mathematical gestures only, because of the obviously rough, inaccurate, and insufficient raw data used. It is futile to refine approximate measurements in any realm of experience, with the purpose of raising obtained data to a level of accuracy. The superstructure is never more stable than its foundation. For example, it is becoming more and more frequently the practice of social science workers to

¹ W. S. Monroe and M. D. Engelhart, "Collecting the Data Specified by a Problem—Basic Techniques," Chapter III in *The Scientific Study of Educational Problems*. New York: The Macmillan Company, 1936; W. A. McCall, *Measurement*. New York: The Macmillan Company, 1939, pp. 3-26.

report simply the median, or it may be the mode, as a point measure for central tendency, instead of the more accurate arithmetical mean; and to use Q , the approximate spread unit, instead of the standard deviation.

Although it is generally assumed that this danger from inaccuracy is more prevalent in the field of the social studies, it should be remembered that this is only a matter of degree. Every report of the result of human measurement in whatever field is based upon the judgment of individuals.² What Kelley calls the "questionnaire method" operates everywhere, and the "personal equation" causes differing results. Usually, a higher degree of accuracy is obtained in natural science, because more objectivity is possible; but errors in physical science are not unknown. Further, natural science has made more sincere and more successful efforts than has social science to inject definite meaning into the indefinite folklore terminology with which it started. For example, the yard, which is said to have been at one time just the distance from the tip of the nose of Henry I to the end of his thumb, has long been standardized in the United States with reference to the length of a particular platinum-iridium meter bar, carefully kept in the Bureau of Standards at Washington, D. C.

It cannot be said that the social scientist is wholly unconcerned about this problem. Witness the efforts at Colorado State College of Education³ to determine a basic professional vocabulary and the terminology of educational statistics in the general field of teacher education, the report of the committee on the social studies of the American Historical Association, and the checking of the sociologists, begun by E. E. Eubank of the University of Cincinnati in 1927, for a basic terminology for their fields.⁴

It is, then, the duty of all who would gather material as the basis of reflective thinking in the solution of problems, to get and use raw data that are free from the errors of carelessness and as nearly accurate as the use of tools of measurement by the hand guided by the human brain will permit. This is the first and basic problem in the examination of the value of hypotheses. A stream never rises higher than its

² T. L. Kelley, *Scientific Method: Its Function in Research and in Education*. New York: The Macmillan Company, 1932.

³ E. U. Rugg, "What Educational Terminology Should a Beginning Teacher Know?" *Educational Administration and Supervision*, 16: 187-195, 1930; F. L. Whitney, *Statistics for Beginners in Education*. New York: D. Appleton-Century Company, 1929.

⁴ A. C. Krey and T. L. Kelley, *Tests and Measurements in the Social Sciences*. New York: Charles Scribner's Sons, 1934; E. E. Eubank, "The Concept of Sociology," *Social Forces*, 5: 386-400, 1927.

source. The value of highly manipulated tabular and graphic reporting depends upon the basic accuracy of originally obtained data.

The use of the word "pertinent" in the first paragraph of this section calls attention to another obvious necessity. In the collection of evidence, the *simon-pure* Baconian method of rather unguided induction will not do. In effective thinking, a tentative direction of effort has been decided on, the final aim or ultimate objective. Every reflective effort, including the collection of evidence on a guessed solution, should peak up to this orientation. Just whatever data can easily be gathered will not be sufficient. Only and all those facts pertinent to the principal aim of the study should be collected. This requires careful discrimination in getting information from selected parts of the field of inquiry, when a total survey is impossible or unnecessary, and involves the problem of sampling.⁵ If the implications of the problem as defined and the direction of the final purpose as decided on are followed, all data gathered as evidence on the value of the hypothesis set up will be pertinent and useful in the reasoning process in progress.

B. Types of Data

Data are the things we think with. They are the raw material of reflection, until by comparison, combination, and evaluation they are stepped up to higher levels of generalization, where again they serve as basic material for further and higher thinking. One distinction among data, then, is in terms of where they are found on the levels of the complete science-philosophy process of reasoning (see Figure 1). Here they are usually designated by a more or less popular terminology, not yet made certain and scientific either by conventional or conceptual accuracy. Such words as inference, hypothesis, concept, theory, fact, principle, law, philosophy, and the like are ordinarily used. No doubt as given they report some degree of increase in general value. They are data of greater and greater significance in reflective thinking.

As suggested, data may be considered also as either *subjective* or *objective*. If they depend very largely upon the personality of the collector of evidence and are easily affected by his preconceptions, prejudices, unthinking opinions, or even his better judgments, they are subjective. This is because these facets of personality in another investigator would change the expressions of amount reported for data. Only when the use of the same tool for measurement will give identical results when employed by different persons, can data be said to be

⁵ G. A. Lundberg, *Social Research: A Study in Methods of Gathering Data*. New York: Longmans, Green and Company, 1929, Chap. V.

perfectly objective. Obviously this is seldom the case. Ten persons using a foot rule and measuring the length of the same table will report ten results. Every measure obtained by the use of the so-called precision instruments of the physicists should be reported as the mean of many applications and corrected for the "personal equation." The aim of both natural and social scientists, then, should be to attain as high a degree of objectivity of data as is humanly possible.

Data may be classified also in terms of the different fields of inquiry in which the thinker may be at work. There are, first of all, either *natural science* data or those found in the *social science* realm. Natural science data include totals resulting from the counting of biological objects, such as the leaves on a tree, the mutations of a plant species, the population of a generation of fruit flies, and similar data. Social science data consist of the facts of human relationships, such as the size of the family, group, or nation, types of public opinion, the life-age of children, their school achievement age, their answers to questions, and so forth, as well as cost figures, activity and difficulty analysis results, the trends of history, business cycles, tax costs, and similar data.

Data may also be classified as *quantitative* or *qualitative*. It will be recognized that in the former category there is more possibility of accuracy; but qualitative data, although relatively hard to measure, usually have the greater importance of generality. This is the criterion of the process of reflective thinking.

Data are also either *attributes* or *variables*. The distinction is that "an *attribute* is usually considered to be a quality, trait, or function that is present or absent. On the other hand, a *variable* simply exists in different amounts. That is, an attribute has to do with the group of the individuals studied according to the presence or absence of a particular quality or trait."⁶

The most usual classification of attributes is *dichotomous*, twofold. For example, a group may be boys or girls, elementary or high school pupils, good or bad, tall or short. But, of course, there may be more items of classification. They may be fast, normal, or slow in progress; geniuses, common run, dubs, morons, or imbeciles, and so on. On the other hand, a *variable* speaks in terms of the quantity of a trait or characteristic—its amount. For example, life age varies with time, and the school marks of a pupil vary by subject, teacher, time, and in accord with many other related factors.

Another basis for classification of data, appropriate to the organization of this book, has to do with the different *methods* and *types* of *research* that the worker may use in the prosecution of his investiga-

⁶ F. L. Whitney, *Statistics for Beginners in Education*. New York: D. Appleton-Century Company, 1929.

tion. It may be that he is engaged in *descriptive* research (Chapter VII), and the data that he is gathering, as the basis for reflection, are life-age facts, school marks, attendance percentages, the details resulting from informational or activity analysis, tuition totals, pupil-unit-cost figures, test scores, questionnaire responses, building status items, assessed valuations, the provisions of state statutes, tax rates and totals, achievement figures, error counts, or a thousand other possible types of data from the realm of education. These may, of course, be obtained from any other field of inquiry, in which the researcher finds himself. They may be as widely derived as the seven inclusive areas of Comte's "encyclopedia," and consist of the data of mathematics, astronomy, physics, chemistry, biology, sociology, or morals.

It may be that the investigator is working in the field of *historical* research (Chapter VIII). Then items of evidence of greater and lesser value, past facts from sources original and secondary, memory incidents from the minds of survivors, occurrences connected with dates and periods, the facts of trends of events or attitudes, and the points of description of the past—all these constitute the data with which the research worker must deal.

The scientist may be engaged in *experimental* research (Chapter IX), and from the survey-experiment-survey rhythm⁷ that he has set up, changes and trends in the status of survey data, such as those listed, are discovered, resulting from the natural operation of social variables in groups of experimental and control subjects or of economic or natural factors found in the situation investigated.

If he is dealing with the *philosophical* type of research (Chapter X), his data will, of course, consist of principles, laws, rules, theories, hypotheses, inferences, conclusions, judgments, and opinions—all types of generalizations of larger or lesser value, depending upon the level of the thinking process on which he finds them, but all beyond and above the realm of scientific fact.

If he is conducting a study in the *prognostic* type of research, the chief purpose of which is to predict (Chapter XI), his data will be no different, of any usable kind, except that he should be unusually certain to deal only with those for which he can find or devise very definite expressions of amount. A summation of errors never results in truth, and the minute mathematical treatment of very rough data is foolish and futile. This has already been said, but it is perhaps most strictly applicable to mathematical attempts to put items of trend into regression equations in order to determine the future status of variables.

⁷ F. L. Whitney, "The Experimental Attitude in Education," *The Teachers Journal and Abstract*, 4: 374, 1929.

In the *sociological* type of research (Chapter XII), the investigator obviously uses the facts descriptive of group life, those connected with human institutions and activities. These are data such as family size, facts of relationship, group psychological reactions, living conditions, recreation units, and organization plans, as well as the residues and the derivations of Pareto.

If the student is working in the field of the *creative* type of research⁸ (Chapter XIII), his material will be derived from those subtle fields of relative values in painting, sculpture, poetry, drama, the dance, and the like, in which he is at work. These data may consist of constant factors, color units, principles of order, color aesthetic, hue, value, chroma, limitation, balance, dominance, neutral, and similar concepts, to take illustrations from the field of color thinking alone.⁹

In the *curriculum* type of research (Chapter XIV), the educator in whatever realm, whether in a public schoolroom,¹⁰ in a vestibule school,¹¹ or in a community forum,¹² is dealing with data inevitably appearing in the rather well standardized procedures of course revision. These data may be the items of content of present course offerings, the life activities of individuals and groups to be taught, and in particular those things done that exhibit difficulties and errors, the judgments of specialists in specific fields, differences in the achievement of those taught in experimental control groups, and similar items pertinent to the making of courses of study.

In fact, when one surveys the different realms of human inquiry, he finds there data existing as more or less definite expressions of amount for the ideas prevailing. And, considered from the viewpoint of the very practical activities of the research worker attacking the solution of a chosen problem, it may be said that data consist of items of more or less objective information found in the situation of research, collected as evidence on conclusions tentatively held. They constitute the background of fact for deductive check on the *workability* of

⁸ Estelle Stinchfield, *A Demonstration and Evaluation of the Principles of Art Structure by the Execution of a Mural*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1935.

⁹ R. G. Ellinger, *The Organization of Color*. Ann Arbor, Mich.: Edwards Brothers, 1935.

¹⁰ A. L. Threlkeld, *The Denver Program of Curriculum Revision*. Denver, Colo.: Denver Public Schools, 1927, Monograph No. 12.

¹¹ H. E. Burtt, "Employment Psychology in the Rubber Industry," *Journal of Applied Psychology*, 4: 1-17, 1920.

¹² J. W. Studebaker, "Planning Civic Education of Adults," *Educational Method*, 4: 291-296, 1935; "Liberalism and Adult Civic Education," *The Annals*, 182: 63-72, 1935.

hypotheses, as well as information to be added to incomplete generalizations.

C. Methods of Collection

The methods and techniques of research include a consideration of the manner in which data are collected, the tools used in this activity, and the way in which findings are classified and interpreted. It will be seen (Chapters VII–XIV) that eight related methods and types of research may be considered as basic and as including the principal kinds of investigations in which the beginner in ordered reflective thinking may engage.

From one point of view, the data dealt with in these different types of studies are either *old* or *new*. Historical and descriptive research will deal with things as they have been and as they are, and will engage in informational analysis of items of bibliography in addition to getting more direct evidence from personal experience and memory and from status checks in present situations. This will be true, also, of philosophical research, which may be thought of as handling generalizations appearing on the higher levels of reflective thinking, found as a rule in publications included in the bibliographies. But experimentation and prediction should consist of and result in something beyond manipulation of vicarious or past or present experience. They seek for new data as evidence for the inferences and hypotheses appearing for examination and deductive evaluation at every stage of the thinking process.

The manner in which educational data are to be collected, then, will from one point of view be determined by the type of research project in which the beginning worker is engaged. Experimentation will demand search among variables operating *in situ* and careful reporting of changes observed over stated development periods. Prognosis makes scientific journeys into the future status of variables, present knowledge of which has been gained through survey, experimentation, and historical check. History repeats the thinking of the past, following experimentation and fact trend there discovered. Philosophy deals with any or all types of data, however scientifically obtained, sublimated to a status of larger value in a higher realm of generalization.

The following caution of Lundberg is applicable to this statement.

Methods of gathering data should be distinguished from methods of manipulating, summarizing, generalizing, or otherwise handling data already collected. . . . It is true that the possible ways of handling data after they are collected are largely determined by the method employed in their collec-

tion, and therefore our method of collection must be governed to a large degree by the method of handling which we expect to employ. But much of the confusion and argument over current classifications of "methods" is due to a failure to distinguish between methods of gathering and methods of classification, treatment, and manipulation. Thus we hear of the historical method, the "case" method, the "statistical" method, the "survey" method, etc. There is nothing mutually exclusive in these classifications. From one point of view, all collections of data are collections of "cases." The "survey" is merely a designation of a type of investigation with reference to scope, and may utilize any or all methods of collecting the data. A useful classification of methods of gathering data, like all classifications, must specify, first, what is the basis or purpose of the classification; and secondly, its categories must be mutually exclusive.¹³

D. Measuring Tools and Devices

Attention has been called to the obvious difference between the data used in the natural sciences and those appearing in the field of the social studies. The former are more definite and objective, the product of more and more careful experiment and definition. A similar contrast appears in means for measurement found in these two realms of human inquiry. Detailed illustration is not necessary; but it is obvious that the surveyor's chain, for example, is a more accurate measuring device than is the Binet-Simon intelligence test.

It is true that, in comparison with the instruments of precision used in more objective fields of research, such as physics and biology, for example, the means of objective measurement in societal research are as yet few, clumsy, in the making, not finally conceived, and not perfect. But, like Touchstone's Audrey, they are our own, and we should be prepared to defend them. And in this intelligent defense and thoughtful use lies the hope for their ultimate perfection. For example, every professionally minded educational worker is obligated to take part in this process of improvement in tests of educational achievement. Refusal to do so is suicidal, as far as hoped-for scientific method in education is concerned. Tools for measurement similar to those now in use in the more objective realms of research must be forthcoming, otherwise no effective check can be had on any progress that may be made.

A caution here should point out the confusion of conception between the words *methods* and *techniques*. One should recognize that the first answers the question, "How?" whereas a technique is a thing with

¹³ G. A. Lundberg, *Social Research: A Study in Methods of Gathering Data*. New York: Longmans, Green and Company, 1929, p. 85.

which we do. In the sample agendum given in Chapter V, it was noticed that the procedures gave the items of research activity in working toward the final aim set up. They told *what* was planned to be done. The methods listed *how* this was to be done. But the techniques mentioned selected measuring devices to be employed. For example, a research worker may decide to determine the value of a new administrative setup in the elementary school (procedure). In doing this, he carries through a controlled experiment of the equivalent-groups type (method). And, in checking differences of pupil achievement among the groups, he uses teacher-made tests, strictly valid in terms of actual content taught (technique).

This analysis is pertinent in the light of the attempt in Chapters VII-XIV to analyze methods and types of research. There is danger of attempting to promote an obvious technique to the importance of method. It will be recognized that many of the words included in Table X as concepts of methods of educational research are actually names of tools only. The test, rating scales, the questionnaire, and the like really suggest certain instruments and devices that are being tried out in the field of educational studies with the purpose of raising them eventually to a high level of usefulness in getting data in that field of endeavor. As such, however, they are of primary importance to the research worker. The beginner should gain good knowledge and skillful control of all of them needed in the prosecution of his study. This necessity is most crucial with regard to the mathematical phases of education statistics.

It is significant to note that this confusion of terminology is quite general among educators engaged in research. This was very noticeable in the result of a poll of fifteen educational research leaders in 1931.¹⁴ In many of the statements published, there was no distinction between basic methods, such as the historical and the experimental, and obvious tools for getting data, for example, the questionnaire and the rating scale. One such mixed analysis is given here, all items listed in the book title as techniques: (a) experimental, (b) historical, (c) psychological, (d) case study, (e) survey, (f) curriculum-making, (g) job analysis, (h) interview, (i) questionnaire, (j) observation, (k) measurement, (l) statistical, (m) tabular and graphic, and (n) library techniques.¹⁵ On the other hand, one careful analysis lists as *methods*, descriptive, historical, case, and case-group; and as *tech-*

¹⁴ A. S. Barr, *et al.*, "A Symposium on the Classification of Educational Research," *Journal of Educational Research*, 23: 353-382, 1931; 24: 1-22, 1931.

¹⁵ C. C. Crawford, *The Technique of Research in Education*. Boston: Houghton Mifflin Company, 1928, p. 320.

niques, measuring devices, interviews, questionnaires, judgments or ratings, and personal observation.¹⁶

A complete discussion of tools and techniques applicable for the efficient getting of data cannot be given here, but an attempt will be made to call attention to the more useful kinds of social science research. In the first place, it should be recognized that just more or less unaided rather informal (a) *observation* is one manner in which to gather evidence. It is noticed that Bixler gives this in his list, and Symonds discusses it. Every normal mind is constantly building up generalizations of some type in this way. If this comes under the influence of specific effort, it becomes, of course, Baconian induction.¹⁷ Perhaps the outstanding illustration of scientific observation is found in the work of Darwin.¹⁸ It is true that he carried on certain experiments, for example with pigeons and in his garden. But the bulk of his data, which eventually emerged in revolutionary form, was the result of material gathered from correspondence, reading, and other means of communication. These he reorganized and classified in his "notebooks." They were "data of record."¹⁹ But this is a very slow process, requiring a persistency and a degree of intelligence possessed by few beginners in research.

It has been noted in a previous paragraph that one of the first hunches that the neophyte thinks he has is that he should rush out immediately with a (b) *questionnaire* when he is looking about for objective material as a basis for his study, for data pertinent to his ultimate objective. But the questionnaire is, perhaps, the worst device he can use, both because of its inherent deficiencies²⁰ and because of its bad reputation.²¹ The arrival of a questionnaire in the morning's mail causes the temperature of many educators to rise rapidly!²² The

¹⁶ H. H. Bixler, *Check Lists for Educational Research*. New York: Teachers College, Columbia University, 1928, pp. 85-87; P. M. Symonds, *Diagnosing Personality and Conduct*. New York: D. Appleton-Century Company, 1931, Chap. II.

¹⁷ Florian Cajori, "Baconian Methods of Scientific Research," *Scientific Monthly*, 20: 85-91, 1925.

¹⁸ Frank Cramer, *The Method of Darwin: A Study in Scientific Method*. Chicago: A. C. McClurg and Company, 1896.

¹⁹ J. C. Almack, *Research and Thesis Writing: A Textbook on the Principles and Techniques of Thesis Construction for the Use of Graduate Students in Universities and Colleges*. Boston: Houghton Mifflin Company, 1930.

²⁰ L. V. Koos, *The Questionnaire in Education*. New York: The Macmillan Company, 1928.

²¹ F. P. Whitney, "The Questionnaire Craze," *Educational Review*, 68: 139-140, 1924; Sam Duker, "The Questionnaire is Questionable," *Phi Delta Kappan*, 29: 386-392, 1948.

²² T. L. Kelley, *Scientific Method: Its Function in Research and in Education*. New York: The Macmillan Company, 1932.

student should examine Bain's and Shannon's analyses of the unreliability of this device,²³ as well as analyses and statements of its limitations.²⁴

But T. L. Kelley of Harvard University calls attention to the fact that an act of human judgment is involved in getting any information about any phenomenon in any realm of thought, even in the so-called sciences, and that the only instrument available for predicting future values is the questionnaire. He thinks that this tool suffers from three disabilities:

(1) There is a "lack of demonstrable fairness in the sample," (2) benefits seldom accrue to every person answering, and (3) there are always difficulties in getting "a fair selection of experts." He believes that "unless and until experimental science relieves us of the need of human judgments, or removes from our minds an interest in unique events, this wayward child of science, feeble as it is, will remain an indispensable helper. It will thus be always needed, and we can but hope that it will curb its intrusive disposition and mend its unseemly ways."²⁵

Among the outstanding research discussions of question blank making are that of L. V. Koos of the University of Chicago and a National Education Association research bulletin published in 1930.²⁶ The former gives as the basic and essential criteria for a good questionnaire (a) the ability and (b) the willingness of the persons approached to make reliable answers. The latter has this score card for the evaluation of a list of questions to be used in getting data in a research study.

²³ Read Bain, "Stability in Questionnaire Response," *American Journal of Sociology*, 37, No. 3: 445-453, 1929; J. R. Shannon, "Percentages of Returns of Questionnaires in Reputable Educational Research," *Journal of Educational Research*, 42: 138-141, 1948.

²⁴ S. A. Rice, "Contagious Bias in the Interview," *American Journal of Sociology*, 35: 420-423, 1929; Abraham Flexner, *Universities: American, English, German*. New York: Oxford University Press, 1930, p. 125; Minerva F. Desing, "Suggestions to the Novice in the Mechanics of Research," *School Review*, 49: 206-210, 1941.

²⁵ T. L. Kelley, *Scientific Method: Its Function in Research and in Education*. New York: The Macmillan Company, 1932.

²⁶ L. V. Koos, *The Questionnaire in Education*. New York: The Macmillan Company, 1929; J. K. Norton, "The Questionnaire," *Research Bulletin*, VIII, No. 1, National Education Association, 1930; C. C. Moore, *An Evaluation of the Curriculum Offered School Superintendents by Institutions of Higher Learning*. Doctor's Field Study. Greeley, Colo.: Colorado State College of Education, 1940, Chap. II, No. 3; W. C. Radford, *The Educational Needs of a Rural Community*. Educational Research Series. Melbourne, Australia: Australian Council for Educational Research, Melbourne University Press, 1939, No. 56, Appendix 5, p. 174; H. Huffman, "Improving the Questionnaire as a Tool of Research," *National Business Education Quarterly*, 17: 15-18, 1948.

THE EVALUATION OF A QUESTIONNAIRE

- | | | |
|---|---------|--------|
| a. Is the questionnaire adequately sponsored? | Yes.... | No.... |
| b. Is the purpose of the study frankly stated, and is it one which calls for a reply under the policy set up for dealing with questionnaires? ✓ | Yes.... | No.... |
| c. Is the questionnaire on a worthy educational topic? | Yes.... | No.... |
| d. Is the questionnaire well organized? | Yes.... | No.... |
| e. Are the questions clearly and briefly worded? | Yes.... | No.... |
| f. Can most of the questions be briefly answered with a check mark or by a fact or figure, and is the number of questions requiring extensive subjective replies kept to a minimum? ✓ | Yes.... | No.... |
| g. Is the information requested not available elsewhere, and obtainable only through questionnaire? | Yes.... | No.... |
| h. Is the questionnaire set up in proper mechanical form? | Yes.... | No.... |
| i. Are the demands of the questionnaire reasonable? | Yes.... | No.... |
| j. Is a summary of results or other proper return promised respondents? | Yes.... | No.... |

G. M. Whipple, former secretary of the National Society for the Study of Education, gives the following seven sensible criteria to follow in making a questionnaire:

- ✓ 1. It should be within the comprehension of those who are to answer it.
- ✓ 2. It should demand a minimal amount of writing.
3. It should be directed primarily to matters of ascertainable fact and less often to matters of opinion.
- ✓ 4. It should elicit unequivocal replies, especially if these are later to be subjected to statistical treatment.
5. It should deal with matters that are worth investigating and that will seem to the recipients to be worth investigating.
6. Although demanding only brief replies, it should stimulate supplementary communications from the recipients.
7. It should promise the respondent a copy of the published results.²⁷

Are these seven standards adhered to in the making of the junior college question blank shown as Table VIII and used in a nation-wide survey? ²⁸ Notice that every junior college president or dean will be fully able to answer (Standard 1), that very little actual writing is required (Standard 2), that no opinions are called for at all (Standard 3), that replies must be "unequivocal" (Standard 4), that the facts asked for are of vital moment to the junior college authorities (Standard 5), that item 11 gives room for supplementary data

²⁷ G. M. Whipple, "The Improvement of Educational Research," *School and Society*, 28: 249-250, 1927.

²⁸ F. L. Whitney, *The Junior College in America*. Colorado Teachers College Education Series. Greeley, Colo.: Colorado State Teachers College, 1929, No. 5.

(Standard 6), and that a copy of the results of the investigation is promised (Standard 7).

Perhaps the American agency that has had the largest experience in collecting and disseminating educational information, data of evidence, is the United States Office of Education. For good forms and methods of procedure, the student should study a number of the reports coming from this center. For example, the W. P. A. report on

TABLE VIII

A JUNIOR COLLEGE QUESTION LIST USED IN 1929

Name of Junior College..... Location.....
President, Principal, or Dean.....

Would you be willing to fill in the items above (if not complete) and to give the information asked for below? Please return this sheet in the stamped envelope enclosed: These data are needed in a nation-wide survey of the junior college that is being made for the state educational institutions of Colorado. Tabulated returns will be available as soon as all junior colleges have replied.

1. Kind of institution: public.....; private.....,
for men.....; for women.....; coeducational.....
2. Number of years of college work offered: one year.....; two
years.....; two years only.....; a total of three years
.....; a total of four years.....
3. Under what auspices or control is your college conducted?.....
(For example: High school district, city school district, junior college dis-
trict, state, private, Baptist church, Lutheran Synod, and so forth.)
4. What year was your junior college established?.....
5. When was your junior college accredited?..... By what
institution?
6. What credit do your graduates receive at your state university?.....
.....semester hours.
7. Number of semester hours required for graduation from your junior col-
lege.....; degree granted.....
8. Number of graduates: 1926-27.....
9. Number of these graduates continuing college work in higher institutions
.....
10. Enrollment: 1926-27, freshmen.....; sophomores.....;
1927-28, freshmen.....; sophomores.....
11. Please give the reasons for the organization of your junior college and its
special purpose.....
.....
.....
12. Please send a copy of your latest catalog and course of study and any other
printed or mimeographed material descriptive of your junior college.
13. Please make lists on the back of this sheet of all the (a) public and (b)
private junior colleges in your state.

Very truly yours,

FREDERICK L. WHITNEY, Director

Department of Educational Research

the status of college alumni²⁹ gives in appendices the details of procedures followed, as well as actual questionnaire forms. Notice that one important test of the question lists is, can the data called for be adequately classified in tabular form? To ascertain this, sample items are tried out in blank tables before the facts are gathered.

The beginner in educational research conceives of the use of the questionnaire first of all as a matter of communication by mail with situations with which he cannot have personal contact; and this is often the reason for its use. Time and funds are frequently not available for anything better. An examination of one outstanding investigation will show that this means of getting judgments may be used even when an adequate subvention is at hand, for in *The Commonwealth Teacher-Training Study*³⁰ the master list of teaching activities was mailed to cooperating educators for checking on a number of points of evaluation.

Further, it has been found, in a recent junior college project, that, when properly made and administered, the questionnaire technique may be quite reliable. "The Minnesota study was a survey of the environmental area and the adjustments of former students of the University of Minnesota. An attempt was made to trace with questionnaires 1,600 cases (all the former students of certain classes) and personal interviews were attempted with 200 of these cases. The interviews were used to check on the accuracy of the questionnaire returns that came by mail. It was found that questionnaires were almost as accurate as personal interviews had been. This is an important discovery. Before we can generalize on this fact, further checking on other types of groups should be made. It may easily be that certain groups of people are more willing to 'tell all' than others."³¹

In the field of sociology, the questionnaire is often called the (c) *schedule*. Its form and content are very well characterized and adequately described in such a book as Lundberg's. Here types of schedules are given, as well as pertinent directions for making them, including their physical aspects, wording, and items to include.

But the questionnaire in its most valuable form is the outline for the

²⁹ W. J. Greenleaf, *Economic Status of College Alumni*. Washington, D. C.: United States Office of Education, 1939, Bulletin, 1937, No. 10.

³⁰ W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929.

³¹ David Segel, "Studies of Adjustment of School Children and Youth," in "Educational Research Studies of National Scope or Significance," Chapter X in J. W. Studebaker, *Biennial Survey of Education in the United States, 1938-1940*. Washington, D. C.: United States Office of Education, 1942, Vol. I, p. 22.

(d) *personal interview*.³² The beginner in research should study carefully the details of its successful use in an investigation such as that made by Charters and Whitley³³ in the field of curriculum-making for the preparation of secretaries. He will note that a variant of the personal interview is the diary report, such as that used among the faculties of state teachers colleges by a prospective doctor of philosophy.³⁴

Three or four other devices for collecting data are commonly employed in educational research. One of these is the (e) *score card*. Very probably education derived this tool from the field of scientific agriculture, where it has been used for some time. The rubrics on the card consist of a tabular outline of the qualities of whatever is to be evaluated. Each of these points is given a numerical value, in amounts so that the total will be a round number like 100 or 1,000. Usually these values are assigned rather arbitrarily or on the summated opinion of a jury of judges. But it is possible to determine more valid expressions of amount for each item on the score card by means of the mathematical technique of partial correlation, in which the coefficients in a regression equation suggest numbers to be used, after each element on the card is correlated with a general judgment.³⁵ Also, rank orders may be changed to analytical expressions of amount, as in the making of the eight score cards for good research in Chapters VII-XIV.³⁶

The score card is employed frequently in school-building surveys and in other checkings, where it is desired to compare similar objective situations and establish norms. Note that this device was used in the two county finance surveys reported in Chapter VII.³⁷ Note also

³² G. A. Lundberg, *Social Research: A Study in Methods of Gathering Data*. New York: Longmans, Green and Company, 1929, Chapter VII; W. V. Bingham and B. V. Moore, *How to Interview*. New York: Harper & Brothers, 1931.

³³ W. W. Charters and Isadore B. Whitley, *Analysis of Secretarial Duties and Traits*. Baltimore: Williams and Wilkins Company, 1924.

³⁴ L. B. McMullen, *The Service Load in Teacher-Training Institutions of the United States*. Contributions to Education No. 244. New York: Teachers College, Columbia University, 1927.

³⁵ F. L. Whitney, *The Prediction of Teaching Success*. Journal of Educational Research Monograph Series. Bloomington, Ill.: Public School Publishing Company, 1924, No. 6; C. T. Gray, *A Score Card for the Measurement of Handwriting*. Austin, Tex.: University of Texas, 1915, Bulletin No. 37.

³⁶ P. H. Coombs, *Prediction of Teaching Success*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930; H. E. Garrett, *Statistics in Psychology and Education*. New York: Longmans, Green and Company, 1930, Table XIII, p. 113.

³⁷ J. F. Moreland, *A Survey of Educational Finance Inequalities in Weld*

(Table IX) a teacher score card⁸⁸ used as a criterion in the construction of a teaching-aptitude test. The twenty-five items of judgment are the final list of telescoped teacher traits reported in the Commonwealth Fund teacher-education study.⁸⁹ They are arranged in order

TABLE IX
SCORE CARD FOR ELEMENTARY TEACHERS, 1930^a

Traits	Very poor	Poor	Average	Good	Excellent	Teacher rating
1	2	3	4	5	6	7
1. Considerateness.....	46	93	140	187	233	
2. Good judgment.....	46	93	140	186	232	
3. Self-control.....	43	87	131	174	217	
4. Enthusiasm.....	43	86	129	172	215	
5. Magnetism.....	42	84	126	168	210	
6. Adaptability.....	36	72	108	144	179	
7. Honesty.....	34	69	104	139	173	
8. Refinement.....	34	69	104	139	173	
9. Neatness.....	32	65	97	130	162	
10. Attractive personal appearance.....	31	64	96	128	159	
11. Industry.....	31	62	94	126	157	
12. Breadth of interest.....	31	62	93	124	155	
13. Carefulness.....	31	62	93	124	155	
14. Health.....	30	59	89	119	149	
15. Cooperation.....	30	59	89	119	149	
16. Forcefulness.....	29	58	87	116	145	
17. Leadership.....	26	52	78	104	130	
18. Originality.....	25	50	75	100	124	
19. Promptness.....	24	48	73	98	122	
20. Dependability.....	24	48	73	98	122	
21. Scholarship.....	21	42	63	83	104	
22. Progressiveness.....	17	35	53	71	89	
23. Open-mindedness.....	15	30	46	62	78	
24. Fluency.....	11	22	34	45	56	
25. Thrift.....	8	16	25	34	42	

Total score.....

^a O. E. Hertzberg and F. L. Whitney, *Professional Aptitude Test for Elementary and Junior High School Teachers*. Department of Educational Research, Study No. 42. Greeley, Colo.: Colorado State Teachers College, 1930.

County, Colorado. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930; W. R. Skipping, *A Study of the Inequalities of Educational Opportunity in Cameron County, Texas*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

⁸⁸ P. H. Coombs, *op. cit.*

⁸⁹ W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929.

of importance as determined by frequency of mention in judgments recorded from twenty-five specialists, and the values in column 6 are obtained by means of Hull's formula for the transmutation of ranks to expressions of amount.⁴⁰

The beginner in research should know also about the (f) rating scale, which deals with differences in quality among the characteristics of the entity to be measured. Usually the scale is made up of a series of samples of the thing to be rated, and they are arranged as a measuring instrument consisting of units from lowest or poorest to the highest or best quality. For example, the pioneer tools used to rate handwriting consisted of actual specimens that had been placed on a scale of values according to the judgments of competent persons.⁴¹ Note also an early illustration of attempts to measure more subtle and subjective qualities in Wells' report on the rating of the literary ability of authors.⁴²

One of the first English composition rating scales, the Hillegas-Thorndike Scale,⁴³ was made by collecting a large number of compositions of young people and having them rated in order of merit by competent judges. This resulted in a total of fifteen steps, or divisions, from quality 0, a very, very poor effort, through quality 18, quality 30, and so on to quality 95, the best of all. By way of illustration of the extremes, the first two low steps and the highest of all follow.

THE HILLEGAS-THORNDIKE ENGLISH COMPOSITION SCALE

Quality 0

Letter

Dear Sir: I write to say that it aint a square deal Schools is I say they is I went to a school. red and gree green and brown aint it hito bit I say he don't know his business not today nor yeaterday and you know it and I want Jennie to get me out.

Quality 18

My Favorite Book

the book I refer to read is Ichabod Crane, it is an grate book and I like to

⁴⁰ Clark Hull, "The Computation of the Pearson r from Ranked Data," *Journal of Applied Psychology*, 6: 385, 1922; H. E. Garrett, *op. cit.*

⁴¹ E. L. Thorndike, "Handwriting," *Teachers College Record*, 11: 83-175, 1910.

⁴² F. L. Wells, "Rating of Ten American Men of Letters for Literary Ability," *Archives of Psychology*, 1: 30, 1907.

⁴³ E. L. Thorndike, *Thorndike's Preliminary Revision and Extension of the Hillegas Scale for the Measurement of Quality in English Composition by Young People*. New York: Bureau of Publications, Teachers College, Columbia University, 1915.

rede it. Ichabod Crane was a man and a man wrote a book and it is called Ichabod Crane i like it because the man called it ichabod crane when I read it for it is such a great book.

Quality 95

If finally we ask what are the limitations of Aristotle, we find none save the limitations of the age and city in which he lived. He lived in a city-state where thirty thousand full male citizens, with some seventy thousand women and children dependent upon them, were supported by the labour of some hundred thousand slaves. The rights of man as such, whether native or alien, male or female, free or slave, had not yet been affirmed. That crowning proclamation of universal emancipation was reserved for Christianity three centuries and a half later. Without this Christian element no principle of personality is complete. Not until the city-state of Plato and Aristotle is widened to include the humblest man, the lowliest woman, the most defenceless little child, does their doctrine become final and universal. Yet with this single limitation of its range, the form of Aristotle's teaching is complete and ultimate. Deeper, saner, stronger, wiser statement of the principles of personality the world has never heard.

Another instrument used in the social studies for getting data is the (g) test, which attempts to measure achievement, ability, or attitudes in quantity amounts. The beginner in research will recognize that this is but an improvement of the time-hoary examination, really only a variant in its different forms of the new-type test.⁴⁴ He will remember that the old-fashioned essay examination, from which his parents suffered, concealed in the "mark" or "grade" given the teacher's judgment on such matters as native intelligence, politeness, honesty, cleanliness, and other character traits, and certain aptitudes, as well as on achievement itself. The test, as an increasingly objective tool for measurement in the field of education, attempts to isolate factors such as these, estimating each separately. This increases its validity.

Illustrations of the different kinds of tests and of their use are easy to find. Only four can be listed here. The Kuhlmann-Anderson *intelligence* test was used by County Superintendent Flora A. Allison⁴⁵ in an evaluation of the pupil groups in the two administrative situa-

⁴⁴ G. M. Ruch, *The Improvement of the Written Examination*. Chicago: Scott, Foresman and Company, 1924; W. A. McCall, *Measurement*. New York: The Macmillan Company, 1939.

⁴⁵ Flora A. Allison, *The Relation Between Pupil Progress and Teacher Qualifications in One-Teacher and Consolidated Schools of Logan County, Colorado*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1929; Frederick Kuhlmann and Rose Anderson, *Intelligence Tests for Ages Six to Maturity*. Minneapolis: University of Minnesota, The Educational Test Bureau, 1929; T. L. Kelley, G. M. Ruch, and L. M. Terman, *New Stanford Achievement Test*. Yonkers: World Book Company, 1931.

tions she studied, her one-room and her consolidated schools. She used also an *achievement* examination, the *New Stanford Achievement Test*, as a battery test of progress in school work over the period of her experiment. Harriet S. Mahan⁴⁶ validated four teaching *aptitude* tests and determined their reliability in predicting the performance of teachers in preparation. These were the Hertzberg-Whitney test, the Bathhurst-Knight-Ruch-Telford Aptitude Test for Elementary and High School Teachers, the Jensen's Stanford Educational Aptitude Test, and the Moss-Hunt-Wallace Teaching Aptitude Test. P. F. Voelker⁴⁷ used a group of *moral conduct performance* tests in his study of character traits with his group of Boy Scouts.

Finally, an eighth measurement tool, which the research worker may need, is (h) the *index*, or *index number*. There is, of course, the well-known cephalic index in use for more than fifty years. In business, there are the price indexes of the Federal Bureau of Labor Statistics, those of Dun & Bradstreet in the wholesale field, and the general economic indexes of Babson. In the general societal field are such indexes as Chapin's for dependence⁴⁸ and Hurlin's⁴⁹ for family work loads. In the educational realm, one finds, among others, the index numbers of G. W. Frasier of Colorado State College of Education and L. P. Ayres, formerly with the Russell Sage Foundation of New York.⁵⁰

Frasier's study used six items to evaluate the efficiency of public education in the city school systems investigated: (1) the percentage of sixteen- and seventeen-year-old children in school; (2) the percentage of elementary school classes smaller than forty pupils; (3) the percentage of children having adequate playground space; (4) the per-

⁴⁶ Harriet S. Mahan, *The Validity and Reliability of Four Teaching Aptitude Tests*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930; O. E. Hertzberg and F. L. Whitney, *Professional Aptitude Test*. Greeley, Colo.: Colorado State Teachers College, 1929; J. E. Bathurst, F. B. Knight, G. M. Ruch, and Fred Telford, *Aptitude Tests for Elementary and High School Teachers*. Bureau of Public Personnel Administration, 1927; M. B. Jensen, *Stanford Educational Aptitude Test*. Stanford, Calif.: Stanford University Press, 1929; F. A. Moss, Thelma Hunt, and F. C. Wallace, *George Washington University Teaching Aptitude Test*. St. Louis: Center for Psychological Service, 1927.

⁴⁷ P. F. Voelker, *The Function of Ideals and Attitudes in Social Education*. Contributions to Education No. 112. New York: Teachers College, Columbia University, 1921.

⁴⁸ F. S. Chapin, "Dependency Indexes for Minneapolis: A New Method in Seasonal and Cyclical Analysis," *Social Forces*, 5: 215-224, 1926.

⁴⁹ R. G. Hurlin, "Indexes of Family Case Work Loads," *The Survey*, 59: 634-635, 1928.

⁵⁰ G. W. Frasier, *The Control of City School Finances*. Milwaukee: Bruce Publishing Company, 1922; L. P. Ayres, *An Index Number for State School Systems*. New York: Department of Education, Russell Sage Foundation, 1920.

centage of well-trained teachers; (5) the percentage of children enrolled who attend school all day; and (6) the percentage of "the increased cost of living that was met by increased salaries for elementary women teachers."

L. P. Ayres measured the type of public education provided in the forty-eight states of the union by means of ten indexes: (1) the percentage of the school population attending school daily; (2) the average number of days attended by each child of school age; (3) the average number of days the schools were kept open; (4) the percentage the high-school attendance was of the total school attendance; (5) the percentage that the boys were of the girls in high schools; (6) the average annual expenditure per child attending; (7) the average expenditure per child of school age; (8) the average annual expenditure per teacher employed; (9) the expenditure per pupil outside of teachers' salaries; and (10) the expenditure per teacher for salaries.

The educational research worker should know that Ayres's list of criteria has been severely criticized and superseded by an evaluation by F. M. Phillip⁵¹ of the United States Office of Education. A number of other attempts have been made to discover valid and reliable indexes of the value and results of public education in America,⁵² including the eight-year evaluation study of thirty secondary schools conducted by the Progressive Education Association. The student should analyze these in order to come to a conclusion about a good list of criteria for the situation in which he is most interested.

These eight illustrations of types of tools that may be used for measurement in social science research are obviously not at all complete. They are cited in order to suggest to the research worker the problem of a choice of the type of measurement device he should use and the specific tool he should select from the many available. Decision here is a serious matter, and should be given the careful attention needed.

⁵¹ F. M. Phillip, "Educational Rank of States, 1930," *American School Board Journal*, 84: 25-29, 37-39, 29-30, 39-40, 1932.

⁵² J. K. Norton, *A Self-survey Plan for State School Systems*. Washington, D. C.: Research Division, National Education Association, 1930; L. M. Chamberlain, *Measures of Educational Performance in the Country School Districts of Kentucky*. Lexington, Ky.: College of Education, University of Kentucky, 1934; Bulletin of the Bureau of School Service, Vol. 6, No. 4; H. E. Schrammel and E. R. Sonnenberg, "The Rank of States According to Educational Achievement on the Basis of Eleven Selected Criteria," *American School Board Journal*, 93: 17-19, 1936; L. E. Raths, "Evaluating the Program of a School," *Educational Research Bulletin*, 17: 52 ff, 1938; W. A. McCall, *Measurement*. New York: The Macmillan Company, 1939, Book Four, pp. 215-320.

E. Summary

It is necessary to get accurate and pertinent data of evidence on the actual value of a hypothesis tentatively held about the solution of the problem selected for investigation.

Data exhibit different levels of generalization. They may be either highly subjective or more or less objective. These facts are found in the field of natural science or in the realm of human values and activities. They are either quantitative or qualitative, attributes or variables, and may also be classified in terms of methods and types of research employed by the worker (Chapters VII-XIV).

The manner in which data are to be collected depends upon the methods and techniques of research used, the method telling *how* and the technique *with what*. Tools to be employed include informal or direct observation, the questionnaire, the schedule, the personal interview list, the score card, the rating scale, the test, and index numbers.

F. Research Exercises

1. Illustrate attributes and variables in the field of education.
2. What are data? Illustrate fully.
3. When are data *new*? Illustrate.
4. Illustrate the fact (a) that data "constitute the background of fact for deductive check on the *workability* of hypotheses," and (b) that they serve "as new information to be added to incomplete generalizations."
5. What are the data of philosophical analysis and evaluation most often used by the prospective master of arts? Illustrate concretely.⁵³
6. Find and report extremes of objectivity and subjectivity, precision and bluntness, facility in use and clumsiness in the tools used (a) in physical science, and (b) in education.
7. Cite and evaluate perhaps the most careful, precise, and objective measurements yet made in the field of educational research.⁵⁴
8. Analyze ten educational studies in which the questionnaire was used and report on the percentage of sampling obtained. What is your conclusion?
9. Evaluate five questionnaires employed in actual studies carried on in the field of education, using the score card found in the National Education

⁵³ H. N. Spencer, *Contributions to Education from the World's Great Utopias*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1927.

⁵⁴ G. T. Bushwell, *An Experimental Study of the Eye-Voice Span in Reading*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1920, No. 17; *Remedial Reading at the College and Adult Levels*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1939, No. 50.

Association Research Division bulletin previously referred to.⁵⁵ If you are using a question list in your own investigation, score that also.

10. Examine carefully the thirty-four words found in Table X, Chapter VII, and report on your own conclusions as to which refer to research methods or types and which to devices and tools.

⁵⁵ J. K. Norton, "The Questionnaire," *Research Bulletin*, VII, No. 1, National Education Association, 1930.

CHAPTER VII

The Descriptive Method

IT HAS BEEN seen that the research worker, motivated by a feeling of need in a specific area of natural or human problems, isolates one carefully defined question for ordered investigation. First of all, the most likely hypothetical answer is selected in the light of the experience and conclusions of all previous students in the field of endeavor. Then this considered guess is evaluated by means of the assembling of all evidence on its value obtainable with ability, energy, time, and funds available. In the plan set up for carrying on this process of reflective thinking, definite things to be done are decided upon, procedures similar to those listed in the sample agenda in Chapter V, for example. For each of these procedures decision is made about methods to be followed and techniques to be used.

It will be seen that among these methods there may appear the basic ways in which the researcher organizes his reasoning, as experimentation, for example, or as historical investigation. Experience has shown that it is very helpful, when one is about to organize a research project, to have a knowledge of these possible methods of attack upon problems to be dealt with. This may reduce expenditures of time, energy, and funds, and make more certain worth-while outcomes. ✓

This knowledge may make it possible to avoid mistakes in the selection of a proper method for a specific procedure. For example, if the beginner has no knowledge or control of the process of experimentation in terms of equivalent groups, he may decide to try to determine the relative value of two contrasting courses of study covering the same area of human experience and need, by comparison of content, by tabulation of the opinions of teachers, by asking publishers or parents, by using so-called standard commercially made tests of achievement instead of locally valid teacher-made tests, by using non-equivalent groups, or by obtaining equivalence in groups used but

failing finally to investigate differences found for reliability.¹ These methods, it will be recognized, are certainly of lesser value. Detailed skill in the experimental method would make possible the use of a process of reflective thinking more nearly in accord with the way in which the normal student research mind naturally works.

A. Classification of Methods of Research

It has been seen in Chapter V that methods involved in reflective thinking (science and research) are to be found among eight psychological steps of the problem-solving process. If the piece of educational research undertaken is scientific, activities engaged in will conform to the usual methods of mind action when a felt need is met and satisfied.

For example, in attempting to locate and define the difficulty that has started the thinking process, many checks of present status in the field of investigation may be made. That is, the situation may be surveyed, tested out, and *described* interpretatively in terms of all obtainable facts about it and in particular with reference to norms. Then it may be desirable also to establish past status, to determine *historical* trends that will throw light upon the meaning of things as they are now. Further, this precession or trend of fact, occurrence, or relationship may be carried in a prognostic way beyond the present time as a *prediction* of the future status of the situation studied. In the criticism of a tentative inference or theory, too, evidence for or against may result from carefully controlled *experimentation*; and if this involves the relative value of traditional and revised courses of study, it is reflective *curriculum-making*. On the higher levels of reflective thinking, in the "corroboration of the idea and formation of a concluding belief," the findings of survey data, of past trends, and of experimentation may be worked over and restated as larger and larger *philosophical* generalizations, until as near an approach as possible is made to ultimate truth. Finally, mind activities may be among *sociological* groups; or in the realm of *creative* thinking in which the resulting product may be a mural, a drama, a musical composition, a marionette play, or the like.²

¹ J. D. Heilman, "The Misuse of Statistical Methods," *Teachers Journal and Abstract*, 5: 440-441, 1930.

² Estelle Stinchfield, *A Demonstration and Evaluation of the Principles of Art Structure by the Execution of a Mural*. Greeley, Colorado: Unpublished Master of Arts Thesis, Colorado State College of Education, 1935; Elizabeth Nixon, *The Meeker Massacre*. Greeley, Colorado: Unpublished Master of Arts Thesis, Colorado State College of Education, 1935; Marjorie H. Batchelder, *A Marionette Production of "The Birds" by Aristophanes*. Columbus: Unpublished Master of Arts Thesis, Ohio State University, 1934; Dorothy Getz, *A Group of Oil Paintings*. Columbus: Unpublished Master of Arts Thesis, Ohio

The distinction between methods and techniques to be used in research is emphasized in Chapter V. Table X is given as an illustration of the confusion existing in the terminology of educational research. It will probably be agreed that such words as *descriptive*, *normative*, *historical*, and *experimental* in three ranks at the top of the table name basic methods of reflective thinking in seeking the solution of a problem. And it may be that *philosophical*, *prognostic*, *curriculum*, and *creative* can be considered to be rather distinct types of investigation, but not truly fundamental methods of research. But, if the other concepts in the list are examined, one finds many that are only the names of tools to be used in gathering data—that is, techniques.

A careful attempt to make a three-way analysis here, separating types and techniques from methods, will be of interest to the research worker. The value of his thinking process may be enhanced, if he can make clear distinctions. It may aid in avoiding indefinite, fuzzy reasoning, approaching that area of “buzzing, booming confusion” characterized by William James as very near to the region of no-thinking.

It is significant to note the relative permanence of judgment, with regard to methods of educational research, among the research men represented over the nineteen-year period included in the original check from which Table X is derived. In 1931, the year of the symposium,³ the words historical, experimental, philosophical, and descriptive were at the top of the rank order array. From 1932 to 1938, the five manuals published put experimental, historical, descriptive, and philosophical near the top. The earlier ten books, 1919 to 1931, emphasized such so-called methods as experimental, historical, survey, case, and questionnaire. Perhaps this would indicate a shift away from older techniques of more or less unthinking survey. This desirable trend is emphasized later.

The list of thirty-four concepts in Table X suggests, also, different bases for the classification of research methods and techniques that may be considered. For example, a word like prognostic has in mind the *objective* of the research activity. Philosophy and psychology name *areas* of thinking. Library gives the *locus*, the location. The questionnaire is a measuring device or *tool*. Table and graph refer to methods of *classification* of data. The word causal suggests *cause*

State University, 1932; Mary W. King, *Illustrations for a Juvenile Book*. Columbus: Unpublished Master of Arts Thesis, Ohio State University, 1933; Margaret Steenrod, *A Study in Soft Porcelains*. Columbus: Unpublished Master of Arts Thesis, Ohio State University, 1934.

³ A. S. Barr, *et al.*, “A Symposium in the Classification of Educational Research,” *Journal of Educational Research*, 23: 353-382; 24: 1-22, 1931.

and *effect* relationships. Interview, activity and documentary analysis, measurement, and observation give different ways of *gathering*

TABLE X

THE RANK ORDER OF THIRTY-FOUR WORDS INDICATING BASIC METHODS, TYPES, AND TECHNIQUES OF EDUCATIONAL RESEARCH FOUND IN FIFTEEN TEXTBOOK MANUALS ^a AND IN A SYMPOSIUM OF SEVENTEEN EDUCATIONAL RESEARCH SPECIALISTS,^b 1919-1938.

Rank	Method, Type, or Technique	Frequency
1	2	3
1	Survey (15), descriptive (10), observation (8), interview (6), normative (4)	43
2	Historical (26), legal (6), library-documentary analysis (2)	34
3	Experimental	25
4	Philosophical	14
5	Case, case group	12
6.5	Prognostic	9
6.5	Questionnaire	9
8	Statistical	6
9	Job, activity analysis	5
11	Curriculum	4
11	Casual	4
11	Genetic	4
13	Correlation	3
15.5	Creative	2
15.5	Comparative	2
15.5	Scientific	2
15.5	Measurement	2
23	Conceptual, constructive, educational, evaluative, integrative, logical, psychological, scientific, speculative, tabular and graphic, techniques.	1 (each)

^a Carter Alexander, *School of Statistics and Publicity*. New York: Silver, Burdett and Company, 1919; W. A. McCall, *How to Experiment in Education*. New York: The Macmillan Company, 1923; P. W. L. Cox, *An Outline of Methods of Research with Suggestions for High School Principals and Teachers*. Washington, D. C.: United States Bureau of Education, 1927, Bulletin, 1926, No. 24; H. H. Bixler, *Check Lists for Educational Research*. New York: Columbia University, 1928; C. C. Crawford, *The Technique of Research in Education*. Los Angeles: University of Southern California, 1928; C. V. Good, *How to Do Research in Education*. Baltimore: Warwick and York, 1928; W. S. Monroe and M. D. Engelhart, *Techniques of Educational Research*. Urbana, Ill.: Bureau of Educational Research, College of Education, University of Illinois, 1928, Bulletin No. 38; H. W. Odum and Katharine Jocher, *An Introduction to Social Research*. New York: Henry Holt and Company, 1929; J. C. Almack, *Research and Thesis Writing*. Boston: Houghton Mifflin Company, 1930; F. L. Whitney, *Methods in Educational Research*.

evidence on the value of a hypothesis held. Statistical suggests the objective *kind* of data used. Case and case group refer to the *subjects* of research, in terms of the sampling of a total population used. The experiment names the *procedure* decided on to be followed in working toward a research objective. Description and history refer to *time*, the present and the past. A. S. Barr, introducing the 1931 symposium, suggests ten possible points of view in the classification of methods of research: fields entered, purpose, place, application, data-gathering devices, character of data, symbols of record, forms of thinking, control of factors, and causal relationships.

In his criticism of the classifications of the symposium, F. N. Freeman of the University of California uses method of procedure as his basis and lists five rubrics: comparison, description, determination of relationships, forecasting, and evaluation. W. H. Kilpatrick of Teachers College, Columbia University, in summing up the fifteen statements, concludes that there can be only three *basic* methods of research, and that these are scientific, historic, and philosophic. This is, of course, not a logical category. The first concept names the *sine qua non* of all creditable research; the second has to do with time location; and the third, with that area of reflection where the largest generalizations appear.

For purposes of analysis and study of different basic methods and useful types of research, so that knowledge and control may be adequate to the demands of the reflective thinking situation in which the student finds himself, it is probable that a completely logical classification is not at all necessary. If the important ways of carrying on the procedures of research are available in skillful memory, it is very likely that purpose, location, kinds of data, areas of human generalizations,

New York: D. Appleton and Company, 1931; T. L. Kelley, *Scientific Method*. New York: The Macmillan Company, 1932; H. H. Abelson, *Art of Educational Research*. Yonkers: World Book Company, 1933; W. S. Monroe and M. D. Engelhart, *Scientific Study of Educational Problems*. New York: The Macmillan Company, 1936; F. L. Whitney, *Elements of Research*. New York: Prentice-Hall, 1950; C. V. Good, A. S. Barr, and D. E. Scates, *Methodology of Educational Research*. New York: D. Appleton-Century Company, 1938.

^b J. C. Almack, Stanford University; F. C. Ayer, University of Texas; J. F. Dashiell, University of North Carolina; F. N. Freeman, University of California; A. I. Gates, Teachers College, Columbia University; C. V. Good, University of Cincinnati; V. A. C. Henman, University of Wisconsin; P. O. Johnson, University of Minnesota; T. L. Kelley, Harvard University; W. H. Kilpatrick, Teachers College, Columbia University; W. A. McCall, Teachers College, Columbia University; G. M. Ruch, United States Office of Education; P. M. Symonds, Teachers College, Columbia University; H. A. Toops, Ohio State University; M. R. Trabue, Pennsylvania State College; F. L. Whitney, Colorado State College of Education; Clifford Woody, University of Michigan.

and other bases will be represented. "After all, a course offered to inexperienced graduate students, just entering the fraternity of research reflective thinkers, cannot effectively be a formal course in logic. It should provide vicarious experience in research thinking, through critical analysis of many published project reports. It should give actual practicum exercise in setting up trial studies in the solution of simple specific problems. At the same time, it should lead into careful work on a selected piece of research to satisfy the thesis requirement. Organization of such a course in terms of two or three basic methods of research, if there are such, would be too unanalytical and too severe for the neophyte. He needs much practice in analysis and agendum construction from many thinking points of view. This would be a teachable course. Unity would be found in the evaluation of each analysis and practicum in terms of the criterion of accepted scientific, that is, reflective thinking, methods."⁴ In this book an eightfold list of methods and types is used, representing a number of the bascs for classification previously discussed. These are description, history, experimentation, philosophy, prediction, sociological, and creative research, and curriculum-making (Chapters VII-XIV).

The beginning research worker should first examine critically both the situation of his planned investigation and the procedures decided on in terms of these eight research attacks. This will make possible a decision on which of them should be used in carrying through his project. For example, he may discover that the core of his need is to find out how something works over a specific period and in a certain place. Obviously, he should isolate factors involved and watch them in operation. He will set up a controlled *experiment*. But the first thing to be done will be to make a check on the initial status of all variables involved in terms of an analytical and critical *description*. And he should, of course, know all about previous investigations in his field of endeavor, the past (*historical*) implications of the situation dealt with. Then, at the close of the experimental period, he will make a final check (*description*), because the invariably successful research rhythm is survey-experiment-survey.⁵ And it may be that he wishes to carry the thinking process of his undertaking into the higher realms of reflection, where interpretation deals with the larger social implications as *philosophical* concepts. Or he reports also

⁴ F. L. Whitney, "Methods, Types, or Techniques of Educational Research." *School and Society*, 54: 282, 283, 1941; C. V. Good, "Fundamentals of Research Methodology," Editorial, *Journal of Educational Research*, 31: 138, 139, 1937.

⁵ F. L. Whitney, "The Experimental Attitude in Education," *Teachers Journal and Abstract*, 4: 374, 1929.

trends of fact or of relationship revealed by historical check, description, and experimentation, and makes valuable *prediction* of the future status and operation of variables studied. At the same time, his project may be *sociological* or *creative*, or in the realm of *curriculum-making*.

It is conceivable that a research study might thus be a complete illustration of all the possibilities of reflective thinking, as applied to the group of problems dealt with. But it will be recognized that it will not be necessary or desirable always to carry every research project forward into all of these methods and types of attack. Furthermore, in most cases it will not be possible, because of the limitations of time or ability, the lack of instruments of precision or of sufficient funds, or because of other deficiencies. For example, a historical study may be simply a cross-section evaluative description of a past situation, and may be a complete piece of research as such; whereas descriptive research would obviously deal with present status in terms of norms carefully interpreted. Philosophical research may report and interpret the larger generalizations found in any field examined; and it would be acceptable at that point of progress, if they are adequately interpreted. An experiment may be written up in terms of the status and changes among variables from initial to final test, including all the conditions of the setup—but dealing not at all, except by way of bibliographic analyses, with previous experiments or with prognostic interpretations. Each of these researches will be a creditable piece of work if it meets the needs of the situation in which the problem is found.

And, of course, some projects may require the application of two methods; some, of three or four; some, more. For example, a very common requirement in the report of a master's experiment is that he give a complete history of experimentation in his field up to the point where his study begins, then report all of the details of his own project, and finally interpret his findings in terms of his ultimate objective and of generalizations discovered in previous investigations. Thus, he uses historical, experimental, and philosophical methods of procedure. In fact, cases of the use of only one method of research in the presentation of an investigation are perhaps difficult to find.

5. Types of Descriptive Research

It has been shown that, in dealing with problems isolated for attack, the hypothetical solution should be examined in terms of data of evidence, so that a judgment may emerge on its final value. Eight ways to get and treat these necessary data are presented in this book (Chapters VII–XIV), the so-called methods and types of research.

To characterize it briefly, it may be said that descriptive research is fact-finding with adequate interpretation. The basic caution to the neophyte here is that the descriptive method has to be something more and beyond just data-gathering, or it is not reflective thinking, not research. The true meaning of data collected should be reported from the point of view of the objectives and the basic assumptions of the project under way (Chapter XVI). This follows logically after careful classification of data (Chapter XV). Facts obtained may be accurate expressions of central tendency, of deviation, or of correlation; but the report is not research unless discussion of these data is carried up onto the level of adequate interpretation. For example, many service bureaus, such as the Federal Bureau of Labor Statistics, furnish periodically groups of very significant facts, which may and do constitute the basic material for research reports. But they are not research until they are subjected to the thinking process in terms of ordered reasoning. It is not difficult to find reports of student investigation that have not been carried adequately beyond the level of unthinking survey. They may be examples of good exposition in acceptable English form of well-classified material, but they do not rise above the level of rather monotonous discussion of the details of data presented. The generalizations, which appear as summation figures in the tables, as trends or surfaces of frequency in figures, and so on, are not recognized in terms of adequate explanation and pertinent conclusion. They are not interpreted.

This point of view is so important that wider authority will be cited for it. Note the dictum of Chancellor R. M. Hutchins of the University of Chicago, given in Chapter I, that "Research in the sense of gathering data for the sake of gathering them has no place in a university." He demands "research in the sense of development, elaboration, and refinement of principles." This is interpretation. Abraham Flexner, representing the General Education Board, states, "I have said that data of one kind or another are not so difficult to obtain. But generalization is another matter. The social scientist may resent the premature generalization of his predecessors. He will himself not get very far unless he himself tentatively generalizes; unless, in a word, he has ideas as well as data. Essays and investigations may be piled mountain high; they will never by themselves constitute a science or a philosophy of economics, psychology, or society. The two processes—the making of hypotheses and the gathering of data—must go on together, reacting upon each other. For in the social sciences as elsewhere generalization is at once a test of and a stimulus to minute and realistic research."⁶

⁶ Abraham Flexner, *Universities: American, English, German*. Oxford, England: Oxford Press, 1930, p. 12.

And finally, the late J. H. Robinson of Columbia University, the leading psychologist-educator-historian of the early part of the century, declared: "It is a fundamental and hopeful discovery to be ranked among the great inventions of mankind, that we do not necessarily learn much about a situation from what is sometimes called a scientific method of dealing with it. We can fill a big book with statistical tables and imposing graphs, but so long as we do not ask how we got into the fix we miss the main point."⁷ See Chapter XVI, Section B, for further emphasis of this point. Data are important, in fact basic, as a start in the thinking process. But, not only should induction be more than Baconian,⁸ without consideration of a well-conceived hypothesis containing the ultimate objective, it should lead logically into skillful classification of data (Chapter XV) and their careful discussion and final interpretation, which will reveal true meanings of general value.

In illustrating descriptive research in terms of a number of types, logical bases for classification will not be sought. Perhaps most often the determining factors are the place where the investigation is set up, the subjects used, and the tools and techniques employed. These considerations will be recognized in the reports that follow. The types given are, of course, not an exhaustive list. However, they deal with a number of the more effective ways of getting and interpreting data in the field of the social sciences. Illustration might be given as well among the natural sciences. There, perhaps more often, one finds careful induction plus interpretation as the method. The physicist in his measurements of precision, the biologist counting and classifying, the zoologist dissecting and comparing, the geologist reading the story of the rocks—all are using the method of description with interpretation.

I. THE RESEARCH SURVEY

The survey, according to recent social science terminology, is an organized attempt to analyze, interpret, and report the present status of a social institution, group, or area. It deals with a cross-section of the present, of duration sufficient for examination—that is, present time, not the present moment. Its purpose is to get groups of classified, generalized, and interpreted data for the guidance of practice in the immediate future.

It is basically important that the beginner in research recognize fully

⁷ J. H. Robinson, *The Human Comedy as Devised and Directed by Mankind Itself*. New York: Harper & Brothers, 1937, p. 18.

⁸ Florian Cajori, "Baconian Methods of Scientific Research," *Scientific Monthly*, 20: 85-91, 1925.

the contrast between too-often-found unthinking survey and adequate scientific description with interpretation. Twenty years ago, William McAndrew analyzed outstanding examples of the desirable and the undesirable in this respect.⁹ More recently, J. B. Sears of Stanford University, the father of the school survey, emphasized the necessity for true research involving "a use of scientific methods and techniques"¹⁰ in worth-while survey. In 1937, W. C. Eells, giving "a reasonable, pragmatic definition of a survey of higher education," summarized desirable attitudes, methods, and techniques for all surveys in descriptive research. "A survey of higher education requires a scientific collection and examination of pertinent data, prevailingly if not exclusively objective in character, concerning a specific problem or problems, systematically presented and constructively interpreted with a view to improvement of the institution or institutions or phase of higher education with which it deals."¹¹

In the case of the public school survey, it is perhaps difficult to find concrete evidence of these research criteria. Too often, a mass of more or less undigested information is published with no attempt to extract meanings and with nothing different or better happening in the district as a result. An outstanding example of exception and excellence in this respect is found in the report of a recent school survey in Los Angeles. The study was inaugurated with three general objectives in view.

1. To survey the assignment of functions to the departments, divisions, and offices of the school system, and to analyze the procedures used in the performance of these functions.
2. To evaluate the present organization as the agency for performing the desirable functions required to conduct the educational program.
3. To develop a recommended organization designed to eliminate present difficulties and improve administrative procedures.

Evidence of reflective thinking during this survey, leading to the generalizations arrived at is found in the frequent statement of "principles" and in the writing of sections in which "evaluation" of present status is reported. One finds such headings as "Principles of School Administrative Organization," "Principles of Budgeting Procedure," "Evaluation of the Cost Accounting Service," and the like. Field

⁹ William McAndrew, "Editorial Comment," *School and Society*, 30: 611-618, 1929.

¹⁰ J. B. Sears, "The School Survey Movement," in J. C. Almack, *Modern School Administration: Its Problems and Progress*. Boston: Houghton Mifflin Company, 1933, pp. 217-262.

¹¹ W. C. Eells, *Surveys of American Higher Education*. New York: Carnegie Foundation for the Advancement of Teaching, 1937, p. 6.

work for the survey was begun in July, 1933, and "most of the changes in the organization and procedures recommended in the survey report have been authorized by the Board of Education and are in effect for the fiscal year 1934-1935."¹²

The principal results of the investigation are listed as follows:

1. The former administrative departments of the Board of Education, namely the Educational Department, the Business Department, the Auditing Department, and the Department of the Secretary of the Board of Education, have been co-ordinated under the direction of the Superintendent of Schools, as the chief executive officer of the Board of Education. The Superintendent is assisted in this responsibility by a Chief Deputy Superintendent.

2. Where possible, divisions have been consolidated, and duplications and overlapping of services have been eliminated.

3. All matters coming before the Board of Education are presented by the Superintendent of Schools, with the assistance of his administrative advisory council. This procedure provides adequate checks with respect to financial provisions, policies, and other matters of information that the Board should have before taking action.

4. The Board of Education is gradually reducing the amount of business handled by standing committees and giving increased consideration as a complete board to matters that require board action.

5. Curriculum and instructional activities have been co-ordinated under the direction of one Deputy Superintendent.

6. The personnel of former central supervisory sections have been re-assigned and thereby made directly responsible to the Curriculum Section or to the supervisory staffs of the Assistant Superintendents in charge of instruction.

7. Managerial duties that formerly consumed much of the time of the Assistant Superintendents have been transferred to a service division under the direction of a Deputy Superintendent.

8. The Assistant Superintendents in charge of instruction have been re-assigned and the schools regrouped so that each Superintendent has full charge of all levels of instruction and supervision in his district. Each Superintendent has been assigned an office in his own district, in order that he may maintain close contacts with the schools and the community.

9. A division of budget and research has been established, which includes bureaus of administrative research, budget, and school building planning. This division is responsible for setting up budgetary procedures, making or supervising all studies in administrative procedure and organization, establishing standards, and developing an adequate housing and transportation program.

10. The budget has been established as the control of expenditures, and the necessary modifications have been made in the Controlling Division.

11. A personnel section has been established for both certificated and non-

¹² O. R. Hull and W. S. Ford, *Survey of the Los Angeles City Schools*. Los Angeles: Los Angeles City School District, 1934.

certificated personnel. Civil service procedures are being established; job and position specifications, desirable examination procedures for selection, and provisions for hearings in cases of removal are being developed.

12. An administrative guide is being prepared in accordance with the recommendation that all members of the staff should have a clear definition of their functions, duties, and relationships.

13. The rules and regulations of the Board of Education are being re-codified, and discrepancies with the new organization corrected.

An excellent illustration of a definite check on what happened after a state survey of teacher education is found in the doctor's dissertation of C. M. Hill¹³ of Yale University. In 1915, checks and recommendations were made on student personnel, teacher personnel, curriculums, and interinstitutional relationships. In the second survey, in 1926, to determine changes, the following items were considered: admission requirements, standards of graduation, size of faculty, preparation of faculty, teaching load, training school and student teaching, organization of the curriculum, and limits of registration of students. The findings on these items of analysis were reported in three parallel columns, for the Missouri teachers colleges in 1926 and the Missouri normal schools in 1915, with reference to the standards of the American Association of Teachers Colleges.

Two public school superintendents conducted descriptive investigations, fiscal surveys, of their home counties in Texas and in Colorado in order to determine the facts of the educational finance inequalities among school districts.¹⁴ These surveyors used identical procedures, methods, and techniques in getting the financial status of the two rural counties, and reported comparative norms in the situations studied, parallel to data from previous county surveys elsewhere.

The ultimate objective in these investigations was "To devise a method of equalizing educational opportunities" in the counties involved "in terms of fiscal support." The proximate steps taken to

¹³ W. S. Learned, et al., *The Professional Preparation of Teachers for American Public Schools*. New York: Carnegie Foundation for the Advancement of Teaching, 1920, Bulletin No. 4; C. M. Hill, *A Decade of Progress in Teacher Training; Specific Administrative Modifications in Missouri Teachers Colleges Which Have Taken Place During the First Decade Following the Carnegie Survey of Tax Supported Normal Schools in Missouri and a Comparison of the Present Situation with the Conclusions and Proposals of the Survey Commission with Suggestions for Further Improvement*. Contributions to Education. New York: Teachers College, Columbia University, 1927, No. 233.

¹⁴ J. F. Moreland, *A Study of Educational Finance Inequalities in Weld County, Colorado*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930; W. R. Skipping, *Some Educational Inequalities in Cameron County, Texas*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

reach this final outcome were: (a) determine the financial status of all school districts in the county; (b) score all the schools in regard to site, buildings, equipment, teachers, and curriculum; and (c) determine each district's ability to support its schools. These were the actual procedures engaged in. The techniques employed for each thing being done were planned in detail in the research students' outlines. Briefly, the factors to be checked were property valuations (real); assessed valuations; school tax rates in district, county, and state; total tax levies, county, state, and Federal school aid; pupil units of valuation based on enrollment; pupil and teacher units of school cost based on both attendance and enrollment; income tax returns; and classes of property escaping taxation. Score cards were used for buildings, sites, and equipment. The county superintendent of Weld County, Colorado, drove over 5,000 miles by auto with a jury of judges to make a personal check of the setup.

The surveyors interpreted and reported the finance facts found "in accordance with the true meaning of each unit of data and in the light of the problems discussed." Summaries were presented of (a) educational inequalities found and of (b) success or failure in attempts to remedy conditions. Concrete recommendations were made for equalizing educational opportunities in the Texas and the Colorado counties. The surveys were creditable educational research.

Attention is called to the excellent survey work in the school system of Sacramento, California, covering a period of contact of about ten years, as an illustration of the retention of an outside specialist and expert surveyor as an educational engineer¹⁵ making status checks with his staff from Stanford University, giving recommendations, and reporting progress. As in any good process of reflective thinking, the work began with a definition of the problems to be attacked.

1. What are the educational needs of the city? These needs are determined by the character of the people racially, socially, intellectually, and occupationally. Once determined, these needs dictate the types of instruction and types of schools to be provided.

2. What is the extent of these educational needs, and what are they likely to be a decade from now? The extent of needs is indicated largely by the number of pupils to be trained. To ascertain the probable future requirements the growth of population must be studied and estimates of probable future enrollment must be made. With these estimates available, the extent of provisions may be determined.

3. Is the city financially able to meet its proper needs and to provide all the facilities called for by sound educational standards? This requires a

¹⁵ F. L. Whitney, "The Consultant Educational Engineer," *Teachers Journal and Abstract*, 5: 440, 1930.

study of the city's financial ability and of proper ways of utilizing school revenues in the development and operation of schools.

4. What is the efficiency of the school system as it now operates? This covers all main features of the school from its aims to its final product. Is the system properly organized and administered; is it well manned; are the curricula sound; is there competent supervision; is instruction satisfactory; do the schools have money enough; are the pupils well housed; and are the children making suitable progress? Numerous technical studies were required to answer these questions. The purpose of these studies is to find the starting point for correcting any existing weaknesses.

5. What changes or extensions are needed to bring the schools up to standard? This is the constructive part of the survey and attempts to show what to do and how to do it.

A few years after the first published report, a second check was made on invitation of the board of education to "determine what progress our schools have thus far made in carrying out the suggestions and recommendations of the survey." The board asked also for counsel "regarding the present unsolved problems of our schools."¹⁶

Survey work among public school units in America very probably began most effectively with such state checks as those of Henry Barnard in Rhode Island and Horace Mann in Massachusetts.¹⁷ Later it spread to the early isolated investigations of city school districts.¹⁸ Beginning with such attempts as that of Denver¹⁹ to make more objective and to centralize the study of school conditions, this movement has appeared in many city and state research organizations. Among the first of these to appear were those in Pittsburgh, Detroit, Pasadena, and New York State.²⁰ Illustrations of

¹⁶ J. B. Sears, *Sacramento School Survey*. Sacramento, Calif.: Board of Education, 1928, Vol. I; *Sacramento School Survey Review*. Sacramento, Calif.: Board of Education, 1930.

¹⁷ Henry Barnard, *Report on the Conditions and Improvements of the Public Schools of Rhode Island*. Providence, R. I.: B. Cranston and Company, 1846; O. W. Caldwell and S. A. Courtis, *Then and Now in Education*. Yonkers: World Book Company, 1924; G. F. Wells, "The First School Survey," *Educational Review*, 50: 166, 1915; Horace Mann, "First Annual Report of Secretary of Board," in *Annual Report of Board of Education*. Boston: Department of Education, 1838.

¹⁸ J. B. Sears, *et al.*, *The Boise Survey*. Yonkers: World Book Company, 1910.

¹⁹ A. L. Threlkeld, *The Denver Program of Curriculum Revision*. Denver, Colo.: Board of Education, 1927.

²⁰ *Curriculum Study and Educational Research Bulletin*, Pittsburgh, Pennsylvania; *Detroit Educational Bulletin*, Detroit, Michigan; *Pasadena Bulletin of Research, Personnel, and Service*, Pasadena, California; W. W. Cox, *A Review of the Theory and an Analysis of the Practices in New York State Schools*. New York: University of the State of New York Press, 1933, Bulletin No. 1025.

educational surveys in city school districts, counties, and state systems are not hard to find. Between 1930 and 1935, four reports of national surveys of land-grant colleges, teacher education, school finance, and secondary education came from the United States Office of Education. These were financed by congressional appropriations.²¹ See Appendix IV, Representative Federal Surveys of Education.

Social surveys (Chapter XII) in general include the educational survey, which covers only about one tenth of all reported surveys of the lower schools. They probably number at least ten times more than those in higher education. W. C. Eells of Stanford University lists and evaluates 585 in this last subfield.²² The seventy per cent of these dealing exclusively with higher education are about equally divided among national and state surveys and checks of separate institutions. Thirty of these reports were designated as "outstanding" by a selected jury of thirty-six "men most experienced in the higher educational survey field." The national investigation receiving the highest rating was that of medical education by the Carnegie Foundation. The three state surveys ranking highest were those of California, Oregon, and Texas. The University of Chicago survey was at the top of the list of separate institutions.²³

2. CONTINUITY DESCRIPTION

Valuable as a complete status survey may be at any point of time in the development of individual, group, situation, or institution, it is obvious that this check represents only a cross-section report of factors operating in the natural or the human activity realms. It furnishes rather significant data for good judgments on hypotheses about how these variables really operate and what generalizations may emerge

²¹ W. C. John, "National Surveys of the Office of Education," Chapter XX in *Biennial Survey of Education in the United States, 1928-1930*. Washington, D. C.: United States Office of Education, 1931, Bulletin, 1931, No. 20.

²² W. C. Eells, *op. cit.*, Appendix VII, pp. 379-452; Allen Eaton and S. M. Harrison, *A Bibliography of Social Surveys: Reports of Fact-finding Studies Made as a Basis in Social Activity to 1928*. New York: Russell Sage Foundation, 1930.

²³ Abraham Flexner, *Medical Education in the United States and Canada*. New York: Carnegie Foundation for the Advancement of Teaching, 1910; Henry Suzzallo, *State Higher Education in California*. New York: Carnegie Foundation for the Advancement of Teaching, 1932; A. J. Klein, *Survey of Public Higher Education in Oregon*. Washington, D. C.: United States Office of Education, 1931, Bulletin, 1931, No. 8; G. A. Works, *Texas Educational Survey Report, Higher Education*. Austin, Tex.: Texas Educational Survey Commission, 1925, Vol. VI; F. W. Reeves, *The University of Chicago Survey*. Chicago: University of Chicago Press, 1933.

through analysis and comparison. Furthermore, this is often all that can be done, because of limitations of tools, energy, funds, or time; or because a report with recommendations is called for at once.

A more complete and valuable knowledge about the operation of natural or social forces may be obtained by watching them analytically at stated intervals in their development, over as long periods of time as seem desirable and possible. This is the genetic method. A partial example of this has already been noted in the case of the educational specialist who was retained by the Sacramento board of education for continuous study of public school problems and who made reports at two points of change and development. Similarly, two or three point checks of changes in variables under measurement over periods of controlled experimentation will be described in Chapter IX, as well as in Chapter XI, where the aim is mathematical prediction.

But if detailed and valuable data are desired about progressive changes in development factors in any situation, more frequent stops should be made along the pathway to get pictures of status. However, it is seldom possible to space these stops at such short-time intervals as to reproduce all of the minutest changes, except when the "movie" camera is set to reproduce the growth of a plant, for example; or when the eye-movement machine traces its pathway on the sensitive plate.²⁴

In the social science field, this continuity-study attitude is being taken more frequently in recent years. Note the long-time checks of physical development by B. T. Baldwin²⁵ of the State University of Iowa, and the California study of gifted children. The purpose of L. M. Terman of Stanford University in the latter longitudinal study is "to determine in what respects the typical gifted child differs from the typical child of normal mentality." Data have been collected on more than 1,400 children, each of whom ranks well within the top one per cent of the unselected school population of corresponding age. The greater part of this report, however, is devoted to 643 of these subjects, who constitute a typical group for whom the data at hand are most extensive. Less inclusive material is reported for a second group of 309 pupils, making a total, in round numbers, of nearly 1,000 gifted children for whom facts have been analyzed. On many points, control data have been secured for 600 to 800 unselected children. The aim has been to collect, as far as possible, information of objective nature, although it has not seemed wise to reject altogether methods subject

²⁴ G. T. Buswell, *An Experimental Study of the Eye-Voice Span in Reading*, Supplementary Educational Monographs. Chicago: University of Chicago Press, 1920, No. 17.

²⁵ B. T. Baldwin and L. I. Stecher, *Mental Growth Curves of Normal and Superior Children*. University of Iowa Studies in Child Welfare. Iowa City, Iowa: State University of Iowa, 1922, Vol. II.

to the influence of the personal equation. In the main, however, the conclusions are based upon well-defined experimental procedures that can be repeated *ad libitum* for purposes of verification or refutation. This genetic study has been carried through more than ten years with frequent checks of the original group of individuals. The group was formed in 1921-1922; and the follow-up case studies were made in 1923-1924, 1924-1925, 1925-1926, 1927-1928, and 1936. The case study for each individual included such data as intelligence, educational achievement, race, health, general information, knowledge of games, plays, and amusements, interests, types of reading material, heredity, vital statistics, socio-economic facts, and similar items.²⁶

Some time ago, F. D. Brooks²⁷ of DePauw University carried on a study of the development of a wide variety of psychological and educational functions over a period of a number of years with annual checks. One hundred seventy-one public school children in Minnesota constituted the subjects of the continuation study. Table XI gives the facts of change, when the abilities are grouped as simpler, memory, higher, and informational. Scoring is in terms of rate; and it is seen that, on the whole, this decreases in succeeding years. The smoothest lines of development are found in columns 10 and 11, where scores are weighted and combined. The boys are seen to have made the greater total gain.

More recently, the personality and academic status of the entering freshman class of 1931, Colorado State College of Education, were traced through four years of college work to the time of graduation with the bachelor's degree.²⁸ The class registered for the first time in

²⁶ L. M. Terman, *Genetic Studies of Genius*. Stanford, Calif.: Stanford University Press, 1925-1930; (a) L. M. Terman, *Mental and Physical Traits of a Thousand Gifted Children*, Vol. I, 1925; (b) Catherine M. Cox, *The Early Mental Traits of Three Hundred Geniuses*, Vol. II, 1926; (c) Barbara S. Burks, *The Promise of Youth; Follow-up Studies of a Thousand Gifted Children*, Vol. III, 1930; L. M. Terman, "Gifted Children," *Journal of Educational Research*, 31: 476, 1938; "Educational Suggestions from Follow-up Studies of Intellectually Gifted Children," *Journal of Educational Sociology*, 13: 82-89, 1939; "Psychological Approaches to Genius," *Science*, 92: 293-301, 1940; M. H. Oden, *The Gifted Child Grows Up*. Stanford, Calif.: Stanford University Press, 1947.

²⁷ F. D. Brooks, *Changes in Mental Traits with Age, Determined by Annual Retests*. Contributions to Education. New York: Teachers College, Columbia University, 1921, No. 116.

²⁸ F. L. Whitney and John Milholland, "A Four-year Continuation Study of a Teachers-College Class," *Journal of Educational Research*, 27: 193-199, 1933; P. F. Ottens, *A Four-Year Continuation Study of the Class of 1931 of Colorado State Teachers College*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931; L. Haas, "Four-year Studies of the Freshman Classes of 1936 and 1940 at Eau Claire State Teachers College," *Journal of Educational Research*, 42: 54-61, 1948.

the fall of 1927 and was checked annually in terms of the following variables: native intelligence, college achievement, and failure to remain in college. The median intelligence score was 51.67 the first quarter and steadily rose to 60.94 at graduation, indicating that the

TABLE XI

MEAN GAINS, AGES NINE TO FIFTEEN, IN SIMPLER, MEMORY, HIGHER, INFORMATIONAL, AND COMBINED FUNCTIONS, EXPRESSED AS HUNDREDTHS OF THE MEAN STANDARD DEVIATION OF AGES ELEVEN, TWELVE, AND THIRTEEN—DETERMINED BY ANNUAL RETESTS, 1929 ^a

Life age (years)	Simpler		Memory		Higher		Informational		All combined	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
1	2	3	4	5	6	7	8	9	10	11
9-10	62	75	77	80	101	95	103	81	93	86
10-11	71	61	58	51	85	76	88	68	80	68
11-12	71	42	53	43	73	65	51	57	63	57
12-13	64	55	29	45	68	59	48	47	54	53
13-14	102	69	10	48	68	68	50	40	57	57
14-15	54	63	27	39	60	54	44	41	49	49

^a F. D. Brooks, *The Psychology of Adolescence*. Boston: Houghton Mifflin Company, 1929, p. 100.

less intelligent students dropped out. Scholarship improved from a central tendency of 3.04 to 3.53. The class, which began 494 strong, included 274 students upon completion of the four-year course.

One of the most recent statements of the prime necessity for the study of human "behavior development" is that of Goodwin Watson of Teachers College, Columbia University, in the report of the subcommittee of the American Council on Education on Problems and Plans in Education. "An important difference between studies which can be dismissed as trivial and others which contribute fundamentally to our knowledge of personality adjustment, is that the weaker studies are usually cross-sectional descriptions of a state of affairs at one moment of time only, while the more valuable research follows development over a sufficient period of time. Unfortunately the cross-section studies are easier to fit into most research schedules. They offer quick returns to graduate students seeking dissertations and

ambitious instructors seeking a long list of publications. The Central European universities (previous to 1932) had achieved a way of making the many short studies fit together into long-term units, by centering research in a given institution about the interests of a dominant professor. He built up a "school," usually with a full theoretical schema, and any student or young instructor expected, if he worked with Stern, or Piaget, or Jaensch, or Kohler, or Wertheimer, or Buhler, to undertake a small portion of a much larger, long-time research plan."²⁹ Ten research reports are given as illustrative of adequately conceived continuity studies.³⁰

The first two of these titles refer to longitudinal studies of wide scope, well staffed and adequately supported. That centered at Yale University, under the direction of A. L. Gesell of the Yale Clinic of Child Development, began with an exploratory survey of three boys and ten girls from birth through their first year of life. After subventions were secured from the Laura Spelman Rockefeller and the Rockefeller Foundations, and the General Education Board, the study has been continued since 1927. The last reports include 524 behavior and physical examinations of 107 infants.³¹ The Harvard Growth

²⁹ Goodwin Watson, "Research in Guidance and Personality Adjustment," Chapter V in W. H. Holmes, *et al.*, *Educational Research: Its Nature, Essential Conditions, and Controlling Concepts*. American Council on Education Studies. Washington, D. C.: American Council on Education, 1939, Series I, Vol. III, No. 10, pp. 130-133.

³⁰ A. L. Gesell and Helen Thompson, *The Psychology of Early Growth, Including Norms of Infant Behavior and a Method of Genetic Analysis*. New York: The Macmillan Company, 1938; W. F. Dearborn, *et al.*, *Scholastic, Economic, and Social Backgrounds of Unemployed Youth*. Cambridge: Harvard University Press, 1938; L. M. Terman, *et al.*, *Genetic Studies of Genius*. Stanford, Calif.: Stanford University Press, 1925-1930; E. L. Thorndike, *et al.*, *Prediction of Vocational Success*. New York: Commonwealth Fund, 1934; W. S. Learned and B. D. Wood, *The Student and His Knowledge*. New York: Carnegie Foundation for the Advancement of Teaching, 1938, Bulletin, No. 29; Susan Isaacs, *Social Development in Young Children*. New York: Harcourt, Brace, 1933; H. R. Stolz, *et al.*, *The First Berkeley Growth Study*. Berkeley, Calif.: Institute of Child Welfare, University of California, 1938; P. R. Lee and Marion E. Kenworthy, *Mental Hygiene and Social Work*. New York: Commonwealth Fund, 1929; Charlotte Buhler, *Der Menschliche Lebenslauf als Psychologisches Problem*. Leipzig: Hirzel, 1933; Grace L. Elliott, *Women After Forty*. New York: Henry Holt and Company, 1936.

³¹ A. L. Gesell, *The Mental Growth of the Preschool Child*. New Haven: Yale University Press, 1925; A. L. Gesell and Helen Thompson, *The Psychology of Early Growth*, *loc. cit.*, A. L. Gesell, *et al.*, *The First Five Years of Life, and A Guide to the Study of the Preschool Child: A Psychological Outline of Normal Development from Birth to the Sixth Year, Including a System of Developmental Diagrams*. New York: Harper & Brothers, 1940.

Study is headed by W. F. Dearborn of the School of Education, and began in 1922 with 3,500 public school children entering grade one.⁸²

Finally, the eight-year investigation of the Commission on the Relation of School and College of the Progressive Education Association among thirty selected secondary schools⁸³ may be cited as having the genetic, longitudinal point of view in educational research. After following the graduates of the experimental high schools into their experience in higher education, three general conclusions were announced: (a) a pupil's success in college is not dependent upon his following a prescribed pattern of subjects or units in the secondary school; (b) the work of the high school can be related much more significantly to each pupil's interests and purposes; and (c) freedom from prescribed college requirements has been a great challenge and stimulation to the participating schools.

3. CASE-STUDY RESEARCH

The *case study* is a complete analysis and report of the status of an individual subject with respect, as a rule, to specific phases of his total personality.⁸⁴ The physician may check the pulmonary region of his patient. The coach may record the muscular reaction of each member of the squad. The classroom teacher may study the silent-reading ability of a backward pupil, or his mental and emotional equipment. These may be status checks resulting in each case in a cross-section picture taken at a specific time;⁸⁵ or they may be development checks, similar to the continuation studies already cited, except that each deals with one individual.⁸⁶

An example is given in Figure 2 of a rather complete check of the subject-achievement status of a pupil at the time of his admission to a so-called "coach room," where individual attention was given to his deficiencies, as compared with the norms of his fellows. This is line

⁸² W. F. Dearborn, "Mental and Physical Development of Public-School Children," *School and Society*, 41: 585-593, 1935; J. W. M. Rath and F. C. Shuttleworth, *Data on the Growth of Public-School Children*, Society for Research in Child Development, Monographs. Washington, D. C.: National Research Council, National Education Association, 1938, Vol. III, No. 1.

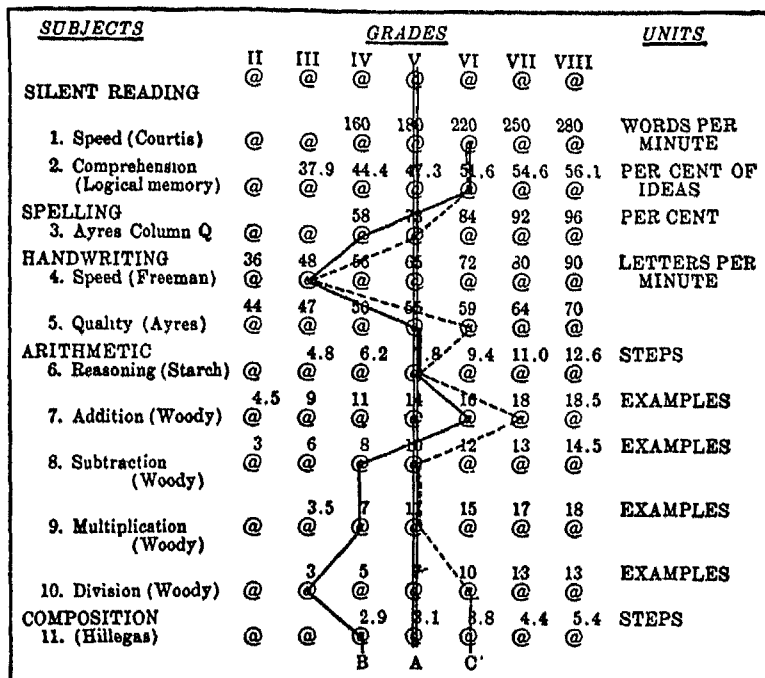
⁸³ W. M. Aikin, et al., *Report of the Commission on the Relation of School and College*. New York: D. Appleton-Century Company, 1942.

⁸⁴ F. N. Maxfield, "The Case Study," *Educational Research Bulletin*, 9: 117-122, 1930.

⁸⁵ Florence Mateer, *The Unstable Child*. New York: D. Appleton-Century Company, 1924.

⁸⁶ C. R. Shaw, *The Jack Roller: The Delinquent Boy's Own Story*. Chicago: University of Chicago Press, 1930; C. L. Burt, *The Young Delinquent*. Chicago: University of Chicago Press, 1925.

B. Line C gives his test scores at the close of the period, when he was returned to his homeroom, after the special teacher in the opportunity room had given him individual help in subjects 3 to 11 inclusive. It will be seen that some gain was made in every case except in speed of handwriting and in arithmetic reasoning ability.



A. V. A. Standards

B. Abilities as shown by First Test.

C. Abilities as shown by Second Test.

Figure 2. PUPIL ACHIEVEMENT RECORD OF JOHN DOE IN THE SPECIAL COACH ROOM OF THE HURON, SOUTH DAKOTA, PUBLIC SCHOOL SYSTEM *

In this case, what actually occurred was continued remedial work over a six weeks' period with the purpose of leveling up achievement. Another more recent study with a similar purpose with respect to silent-reading ability alone may be cited. Here, in the case of a "problem child, who for various causes has been unable to master the techniques necessary for skill in reading," a course of one hour daily

* F. L. Whitney, *Report of the Superintendent of Schools, 1916-1917*. Huron, South Dakota: Board of Education, 1917.

of individual instruction was continued for about five months "to determine just what could be accomplished in a relatively short time by the use of proper psychological methods with a child of normal intelligence, retarded several years in reading."³⁷ Procedures carried through in this piece of research were: (a) determine the home and school history; (b) determine objectively the child's present status; (c) diagnose the subject's reading difficulties; (d) determine the causes of the child's reading deficiencies; (e) select, evaluate, and apply remedial measures; (f) measure the results of the teaching; and (g) report the study.

A very complete longitudinal case-study check is reported as Analysis 36 in the "Case Book" of the Committee on Scientific Method in the Social Sciences of the Social Science Research Council.³⁸ This deals with the case of a Greek boy from his sixteenth to his twentieth years. He was referred to the Judge Baker Foundation by the Juvenile Court of Boston. The report³⁹ includes facts on (a) family and ancestry, (b) physical status and growth, (c) home and neighborhood, (d) habits and interests, (e) school history, (f) court record, (g) experience in foster homes, (h) mental test scores and personality traits, (i) his own story, and (j) his subsequent history, including data from a last examination and his autobiography.

The case-study type of descriptive research may operate also as *case-group investigations*. More or less unitary social or academic groups are isolated for analysis, usually with the purpose of possible improvement. As in the case of individual checks, these researches may also be either status studies or continuity surveys extending over appreciable periods of time. The latter attack is more important.

One of the most complete early case-group studies was reported in five volumes in 1918 by the noted sociologist, W. I. Thomas.⁴⁰ This is evaluated in Analysis 8 of the "Case Book" already cited.⁴¹ Analysis 37 deals with F. M. Thrasher's classic description of needy boy life in Chicago.⁴²

In the public school situation, subjects are probably most often

³⁷ Claire S. Leuenberger, *A Case Study in Diagnostic and Remedial Reading*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

³⁸ S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, pp. 502, 503.

³⁹ W. A. Healey and Augusta A. Bronner, editors, *The Judge Baker Foundation Case Studies*. Boston: The Judge Baker Guidance Center, Series 1, Case Study No. 1, 1922.

⁴⁰ W. I. Thomas and Florian Znaniecki, *The Polish Peasant in Europe and America*. Chicago: Richard Badger, 1918.

⁴¹ S. A. Rice, *op. cit.*

⁴² F. M. Thrasher, *The Gang: A Study of 1,313 Gangs in Chicago*. Chicago: University of Chicago Press, 1927.

grouped for study. The techniques of grouping on the basis of intelligence and of slow- and fast-moving pupils need no specific illustration. And on the secondary level, one finds the extracurriculum administered in terms of many interest and ability groups. J. D. Heilman of Colorado State College of Education isolated 1,000 ten-year-old children in Denver, Colorado, for a determination of the relative effect of home and school on learning.⁴³ The controlled experiment (Chapter IX) deals with unitary groups carefully determined and isolated in activity. Witness equivalent groups in such studies of learning as that of C. V. Good of the University of Cincinnati.⁴⁴

A recent unpublished check of the graduates of the Colorado State College of Education College Secondary School in comparison with a control group of fifty coming from other high schools reports their group differences in terms of life age, matriculation scores in intelligence, English, and elementary subjects, hours of study, hours in class, hours commuting and their per cent, hours of outside work and their per cent, college class grades; attitudes, critical reflection scores, and interests and activities. The last three variables were measured with instruments used in the Progressive Education Association Eight-Year Evaluation Study,⁴⁵ conducted by its Commission on the Relation of School and College. Norms in comparison with the larger investigations were reported. These data were used in the evaluation program of the North Central Association.

4. JOB AND ACTIVITY ANALYSIS

An analytical knowledge of the details of human activity for the purpose of improvement is the basic reason for the movement that came to be called job analysis in industry, and business and activity analysis when the curriculums of educational efforts were under consideration. Job analysis⁴⁶ received a great impetus at the time of

⁴³ J. D. Heilman, "The Relative Influence upon Educational Achievement of Some Hereditary and Environmental Factors," *Nature and Nurture*. Chicago: National Society for the Study of Education, 1928, Yearbook XXVII, Part II; and "A Revision of the Chapman-Sims Socio-Economic Scale," *Journal of Educational Research*, 28: 117-128, 1928.

⁴⁴ C. V. Good, "The Effect of a Single Reading Versus Two Readings of a Given Body of Material," *Journal of Educational Method*, 5: 325-329, 1926.

⁴⁵ W. M. Aikin, et al., *Report of the Commission on the Relation of School and College*. New York: D. Appleton-Century Company, 1942.

⁴⁶ W. B. Jones, *Job Analysis and Curriculum Construction in the Metal Trades Industry: A Contribution to the Study of Curriculum Construction in Vocational Education Based on Job Analysis of the Pattern Makers Trade*. Contributions to Education. New York: Teachers College, Columbia University, 1926, No. 227; E. K. Strong and R. S. Uhrbrock, *Job Analysis and the Curriculum with Special Reference to the Training of Printing Executives*. Baltimore: Williams and Wilkins Company, 1923.

World War I in attempts to classify and use more effectively the men of the draft.⁴⁷ An illustration in manufacturing is found in the work of Burr⁴⁸ in a Canadian rubber-tire factory. Here a complete check of the manipulative process, at each step of making and with each machine used, was made and recorded in objective expressions of amount. Relative values in the total job were determined by the technique of partial and multiple correlation, and a regression equation was made for the office of the plant psychologist (Chapter XV). The regression coefficients in this tool were evaluated for each job applicant by tests, and a summation furnished data for a decision on the desirability of giving him a tryout and instruction in the vestibule school of the factory.

The problem of getting valid preparation content in the education of pharmacists,⁴⁹ secretaries, and other "white-collar" workers has been attacked in terms of a determination of just what things done and what attitudes are involved in each case. For example, W. W. Charters and his associates, then at the University of Pittsburgh, in seeking for basic material for courses for prospective secretaries, interviewed many secretaries and their employers. The duties and qualities of successful secretaries were sought. Duties were classified as easy or more difficult to learn, and as best learned in college or on the job. "A list of forty-seven traits conspicuously present in successful secretaries and conspicuously absent in unsuccessful secretaries was obtained through interviews with employers. The traits thus secured are ranked in order of frequency of mention by employers and are defined in terms of trait-actions through which they are expressed in secretarial work."⁵⁰ These data were used in the organization of courses for the preparation of commercial secretaries at the University of Pittsburgh.

It will be recognized that this is activity analysis for the purpose of curriculum construction (Chapter XIV), which operates on the theory that learners should be taught to do better what they will do anyway. One of the classic studies in this field was that of W. W.

⁴⁷ R. M. Yerkes and C. S. Yoakum, *Army Mental Tests*. New York: Henry Holt and Company, 1920.

⁴⁸ H. E. Burr, "Employment Psychology in the Rubber Industry," *Journal of Applied Psychology*, 4: 1-17, 1920; and *Employment Psychology*. Boston: Houghton Mifflin Company, 1926.

⁴⁹ W. W. Charters, A. B. Lemon, and L. M. Monell, *Basic Material for a Pharmaceutical Curriculum*. New York: McGraw-Hill Book Company, 1927.

⁵⁰ W. W. Charters and Isadore B. Whitley, *Analysis of Secretarial Duties and Traits*. Baltimore: Williams and Wilkins Company, 1924.

Charters and Edith Miller in Kansas City.⁵¹ Here valid content was sought for the city courses in English usage. Obviously, a complete activity analysis of everything said and written by Kansas City public school pupils was impossible. Further, it would have been useless and undesirable. The limitations of school time would have prevented the teaching of every item of oral and written activity found. For this reason, attention was concentrated on errors; and a difficulty analysis yielded that portion of everything done that did not conform to usage. This material became the basis for the "grammar" course.

A more recent activity analysis in the field of curriculum construction for the preparation of small-system school superintendents may be cited⁵² (Table XXXI). Here a technique identical with that used by Charters and Waples, and published later in their larger determination of the professional activities of all types of teachers,⁵³ was used. Miss Nanney's aim was to determine the duties actually performed by representative superintendents of small-school systems and to evaluate them in terms of which duties were difficult to perform, which were best learned in college, and which could be learned on the job. Her principal procedures were: (a) select schools of from five to thirty teachers; (b) analyze all previous research bearing on the duties and difficulties of small-town principals and superintendents; (c) prepare a tentative list of duties gathered from this analysis and from the students and faculty of the college; (d) classify the duties under seven different headings for use in the questionnaire to be used and in personal interviews; (e) classify the returns; and (f) write the report.

The contribution of the point of view of activity analysis for determination of course content has been marked. In teacher preparation, it has appeared in the movement toward proper professionalization of teachers-college curriculums, the principles for which were stated in 1924.⁵⁴ Following the publication of Charters' Commonwealth Fund report, there was for a while perhaps too naïve an acceptance of its findings of fact as useful in the organization of teacher-preparation projects. A number of "perplexities"⁵⁵ that

⁵¹ W. W. Charters and Edith Miller, *A Course of Study in Grammar Based Upon the Grammatical Errors of School Children in Kansas City, Missouri*. Columbia, Mo.: University of Missouri, 1915, Education Bulletin No. 9.

⁵² Virgie L. Nanney, *Analysis of the Duties and Difficulties of Superintendents of Small School Systems*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925.

⁵³ W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929.

⁵⁴ E. O. Randolph, *The Professional Treatment of Subject Matter*. Baltimore: Warwick and York, 1924.

⁵⁵ F. T. Spaulding, "Perplexities in Teacher Training," *Elementary School Journal*, 30: 270-290, 1929.

troubled thinking educators soon appeared. Among these was that of degrees of transfer of training postulated. Must the activities included be mastered one by one, or may generalization permit their learning in related groups?

5. LIBRARY AND DOCUMENTARY RESEARCH

Descriptive research may be in terms of surveys and critical analyses of available data in printed form. This is informational analysis, or library research, as it is called at times. It constitutes one technique of historical research, as history deals with records of the past. Obviously, making bibliographic lists is not research; but a critical evaluation of a unitary group of material with interpretation in terms of comparison and generalization may employ reflective thinking. Note reports such as those of R. L. Lyman, W. S. Gray, and G. T. Buswell and C. H. Judd of the University of Chicago, as well as those of F. D. Curtis of the University of Michigan.⁵⁶ E. U. Rugg of Colorado State College of Education has a similar analysis and interpretation in the field of the extracurriculum in secondary education.⁵⁷ A report similar to Rugg's summates and interprets a group of curriculum studies at the University of Chicago,⁵⁸ and the technique of documentary analysis is illustrated in a number of the investigations analyzed.

It is seen that documentary analysis is an essential technique in curriculum-making (Chapter XIV). It is one way of determining the content of present offerings in courses of study under revision. It is also a source of objectives, when an answer is sought to the question, "What ought to be taught?" It often takes the form of catalog, textbook, or syllabus⁵⁹ analysis. It operates on the assumption that, if

⁵⁶ R. L. Lyman, *Summary of Investigations Relating to Grammar, Language, and Composition*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1929, No. 36; *The Enrichment of the English Curriculum*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1932, No. 39; W. S. Gray, *Summary of Investigations Relating to Reading*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1925, No. 28; G. T. Buswell and C. H. Judd, *Summary of Educational Investigations Relating to Arithmetic*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1925, No. 27; F. D. Curtis, *A Digest of Investigations in the Teaching of Science*. Philadelphia: P. Blakiston's Sons and Company, 1926, 1931, and 1939, Vols. I, II, III.

⁵⁷ E. U. Rugg, *Summary of Investigations Relating to Extra-Curricular Activities*. Colorado Teachers College Education Series. Greeley, Colo.: Colorado State Teachers College, 1930, No. 9.

⁵⁸ Franklin Bobbitt, *Curriculum Investigations*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1926, No. 31.

⁵⁹ Bertha Lindblad, *The Chemistry Found in Elementary High School Biol-*

the reading activities of people may be analytically determined, one has a good indication of their life activities—the things they do. One of the most complete studies of this type is that in the social sciences by H. O. Rugg of Teachers College, Columbia University, and his associates. This resulted, in tryout form, in the social science pamphlets, which appeared later as textbooks. The point of view and method of this project is discussed in the report on map location.⁶⁰ In selecting the content of the social science curriculum, five psychological characteristics of society were determined, largely through analysis of current publications:

First, the insistent and more permanent problems of the economic, political, and cultural order. Second, the chief generalizations, the modes of relational thinking upon a mastery of which the intelligent consideration of the problems of society depends. Third, the cue concepts, the fundamental notions which epitomize the connotational background that an individual possesses of the various aspects of the current order. Fourth, the detailed material of the social science field: the great movements and themes underlying American life and how they came to be; the epochs through which those movements have revealed themselves, the focal person and events, and the corresponding important facts of time and place. Finally, and here we touch the controlling goal of curriculum-making, studies of the directive attitudes and ideals that should dominate human conduct; attitudes for example, of sympathetic tolerance, of critical questioning; ideals of honest conduct, pride in craftsmanship, etc.⁶¹

In the catalog analysis of Gladys C. Bell, now Dean of Women at the University of Denver, the purpose was to determine the details of the content of courses in oral English offered in the standard four-year teachers colleges of the United States. This was one segment of an attempt to revise the course in oral English in the curriculum of Colorado State College of Education, a companion study seeking for objectives, and dealing with other necessary methods and techniques.⁶²

ogy Textbooks. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

⁶⁰ H. O. Rugg and John Hockett, *Objective Studies in Map Location*. Social Science Monographs. New York: Lincoln School of Teachers College, Columbia University, 1925, No. 1, p. 25; H. O. Rugg and Emma Schweppe, *Town and City Life in America*. Social Science Pamphlets. New York: Gazette Press, 1922, Vol. I, Pamphlet No. 1; H. O. Rugg, *Changing Governments and Changing Cultures: The World's March toward Democracy*. Boston: Ginn and Company, 1933.

⁶¹ H. O. Rugg and John Hockett, *Objective Studies in Map Location*, loc. cit.

⁶² Gladys C. Bell, *An Investigation of the Oral English Courses in the Teachers Colleges and Normal Schools of the United States*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925; Abigail Casey, *A Teachers College Course of Study in Oral English for Junior High School*

It is obvious that this study, as an attempt to learn the actual things taught in the courses listed in the catalogs, was of lesser value. Catalog analysis is the least efficient way to check present curriculum offerings. Many courses listed are never taught, and the brief characterization of purpose and content given may not represent at all what actually occurs in the classroom.

On a level somewhat above this technique, one finds syllabus and textbook analysis in use in attempts to describe, in the case of any curriculum segment, what is being taught. For example, W. E. Peik's study, at the University of Minnesota,

. . . investigated intensively the educational prescription of a single institution. It can therefore begin where job analysis ends; for job analysis helps to set up a training program by defining the objectives and showing the relative importance or difficulty of each activity for which training is to be provided. In this study a curriculum as set up scientifically or unscientifically, no matter how, is examined to ascertain its character and content in considerable detail and to evaluate its adequacy directly in terms of the reactions of those who have been trained by it. It is a method of self-checking by local instructors in education, as curriculum makers, for the validation of their offering against the professional demands of secondary teaching in the field where teachers whom they have trained are working.⁶³

The entire study embraced five procedures: (a) a content analysis of the prescribed courses in education; (b) the analysis of treatment emphasis accorded to this content by the instructors; (c) the canvass of teacher judgments regarding the professional value to them of the training given; (d) the presentation of the data of analysis and evaluation in usable form for faculty use; (e) content selection and treatment control for curriculum revision and refinement based upon obtained objective data. It will be seen that documentary analysis is involved in procedure (a), in which the syllabi of the institutions were dealt with.

Of course, textbook and syllabus analysis suffers from the same disability as catalog checking, in attempts to describe what actually takes place at the time of teacher-student contact in the classroom. It is only a little more successful. A true report might be obtained by detailed daily note-taking on the part of students registered for the course or by stenographic reports of all that is said at every meeting

and Senior High School Teachers. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925.

⁶³ W. E. Peik, *The Professional Education of High School Teachers: An Analysis and Evaluation of the Prescribed Courses in Education for Prospective High School Teachers at the University of Minnesota.* Minneapolis: University of Minnesota Press, 1930, pp. 4-7.

of the class. The method of detailed note-taking has been tried at George Peabody College for Teachers and at Colorado State College of Education, but no printed reports are available. Stenographic reports were used by W. P. Burris,⁶⁴ of the University of Cincinnati, in an attempt to publish complete case books, similar to those used in law school, for instruction in education classes; but the project was not carried to completion. This plan was to get a complete picture of many teaching situations by reporting, in addition to everything said by everybody present at specific class meetings, the details of physical environment in the classroom, the status of all variables represented in the teacher's personality and in that of each pupil present, the content of the course being presented, and so on. It is a distinct loss to teacher education that Mead's project was never completed. Spasmodic attempts in terms of stenographic reports of class work have appeared,⁶⁵ but to date very probably no complete report of actual curriculum content in any course taught has been made.

Another type of documentary study may be called *legal analysis research*. This deals with statutes and law cases. In the field of public school legal problems, I. N. Edwards of the University of Chicago has perhaps made the greatest progress, although a good survey has been published.⁶⁶ Research has found many problems in the field of public school law: district organization, authority of boards of education, legal status of school officers, school debt, school taxes, tort liability, employment and dismissal of teachers, control of pupils, and others.

One master's study reports the relationship of state statutory law to one segment of the public school curriculum. An analysis of laws of the states was made, and all provisions referring to character education were briefed. One hundred and fifty-four specific objectives were mentioned in the statutes. These were compared to provisions made in the states to attain the aims set up. For this purpose,

⁶⁴ W. P. Burris, "The Case Method in the Study of Teaching and Its Value in the Professional Education of Teachers," *Studies in Education*. Educational Monographs. Iowa City, Iowa: Society of College Teachers of Education, 1923, No. XII, pp. 71-83; "The Case Method for the Study of Teaching," *School and Society*, 15: 121-130, 1922.

⁶⁵ E. H. Reeder, *A Method of Directing Children's Study of Geography*. Contributions to Education. New York: Teachers College, Columbia University, 1925, No. 193, pp. 12-17.

⁶⁶ I. N. Edwards, "Methods and Materials of Legal Research," *Review of Educational Research*, 4: 85-91, 1934; and *The Courts and the Public Schools*. Chicago: University of Chicago Press, 1933; Frederick Weltzin, *The Legal Authority of the American Public School*. Lincoln, Neb.: Mid-West Book Concern, 1931.

. . . eight representative state courses of study were selected and analyzed on the same plan as that used in checking the laws except that the references were not retained. In these eight courses of study, preparation was made for the teaching of 164 specific character objectives, as compared to the 154 objectives found mentioned in the 48 state laws. Apparently, each of the states was more than meeting the legal requirements.⁶⁷

C. Criteria for Descriptive Research

The so-called survey⁶⁸ and testing⁶⁹ movements in education have exhibited the dangers involved in moving into a comparatively new field of inquiry with attempts to make possible better reflective thinking in terms of more definite and more objective expressions of amount for measurement of progress and results. Inevitably, there will be at first fumbling and thoughtless action without definite purpose. But some progress in better methods and techniques is being made. The time has passed when a too naïve attitude was taken toward the values of survey checking and of testing. The actual case of a young superintendent, who long ago reorganized his small system with a junior high school on the basis of one survey group intelligence test, might not be duplicated anywhere now. And, more and more, supervisors and classroom teachers are learning that school achievement testing should be with definite and well-planned objectives and by means of homemade, completely valid instruments whenever possible. Fewer small-town school superintendents brag about the administering of commercially purchased tests, really given without diagnostic aim and mayhap even without scoring and classification.

The method of problem solving by means of adequate cross-section information for comparison and interpretation has long been exhibited in the thinking activities of both natural and social scientists. Scientific observation⁷⁰ is not new. Witness the work of Darwin, charac-

⁶⁷ B. D. Gilman, *The Legal Control of Character Education*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930; F. L. Whitney, "State Legislative Provision for Character Education," *School and Society*, 33: 306, 1931.

⁶⁸ G. F. Wells, "The First School Survey," *Educational Review*, 50: 166, 1915; J. B. Sears, "The School Survey Movement," in J. C. Almack, *Modern School Administration: Its Problems and Progress*. Boston: Houghton Mifflin Company, 1933, pp. 217-262; Henry Barnard, *Report on the Conditions and Improvements of the Public Schools of Rhode Island*. Providence, R. I.: B. Cranston and Company, 1946; O. W. Caldwell and S. A. Courtis, *Then and Now in Education*. Yonkers: World Book Company, 1924.

⁶⁹ Joseph Peterson, *Early Conceptions and Tests of Intelligence*. Yonkers: World Book Company, 1925; M. M. Thompson, *An Outline of the History of Education*. New York: Barnes and Noble, 1933, pp. 138-141.

⁷⁰ P. M. Symonds, *Diagnosing Personality and Conduct*. New York: D. Appleton-Century Company, 1931, Chap. II.

terized in Chapter I. It is reflective thinking, if actuated and directed by well-considered objectives and hypotheses. The botanist thinks in terms of the data of ecology. Checks on natural resources make possible a national policy of conservation. Daily telegraphic reports on winds, air pressure, and other data emerge as weather maps and predictions. The facts of human mortality direct insurance rates. A summation of knowledge about the relics, monuments, and remains of the past helps to interpret previous cultures. Clever classification of the data of case studies yields useful generalizations for welfare work. The thinker in every field of mind activity needs to know. One means is careful, ordered description with interpretation.

The method of description has its dangers, and useful positive criteria may be suggested by them. There is the danger of complete absorption and satisfaction with present status. This is unprogressive, backward-looking conservatism. In curriculum-making (Chapter XIV), this would insure the perpetuation of the cultures of the past, but on the same level, with no future improvement. Calling in the specialist, the philosopher in the field, and the pioneer thinker prevents this, and raises the status of the next generation onto a higher plane of activity. There is, also, the fallacy of the median, resulting in decisions, not on intimate knowledge about the entire distribution of facts and conditions, but on too insistent assumption about the value of central tendencies. Making decisions on the basis of averages alone is, perhaps, a hangover from the time of curriculum-making and teaching with the mythical "average child" in view. Distributions of individual differences are now recognized, and educators are thinking and reporting most often in terms of types of curves found, analyzed as spread and relationship measures. Then there are the conclusions about causal relationships based on mathematically obtained coefficients of correlation. Of course, the fact of correlation cannot at all be always interpreted as causation, nor can it be known which factor is cause and which effect without intimate knowledge about all of the details of the situation, the concomitant variables present, and so on. If a pupil's school attitude and achievement change at the onset of pubescence, careful search is necessary among all accompanying circumstances before a real cause can be assigned.

One finds a number of statements of desirable procedures and techniques in normative thinking, descriptive research. J. B. Sears⁷¹ of Stanford University believes that the school survey (a) should aid in the formation of policies in terms of a statement of aims, a plan of procedure for the attainment of these aims, and a statement of principles to guide in the execution of the plan of procedure recom-

⁷¹ J. B. Sears, *The School Survey*. Boston: Houghton Mifflin Company, 1925.

mended. He thinks also that it (b) should aid in evaluating the results of the operation of the policy adopted, (c) should furnish well-classified information, and (d) should stimulate better work in the school system in general. His work in Sacramento, cited in Section B, as well as the surveys of Arlington, Modesto, Boise,⁷² and elsewhere, illustrates these criteria.

J. C. Almack, also at Stanford University, emphasizes for "the normative methods": (a) validity and reliability of tests used; (b) norms adequately obtained; (c) the use of expert judgment in interpretation; and (d) that "... the results of normative methods" should be "subjected to just as severe tests as the laws derived from experiment."⁷³

H. H. Abelson⁷⁴ of the College of the City of New York holds for: (a) representations of data in descriptive research; (b) adequate procedures for observing external phenomena and experience; (c) expert construction, selection, and application of tests and rating devices; (d) careful choice of field; (e) collection, validation, and classification of data; and (f) interpretation of findings.

The National Committee on Research in Secondary Education⁷⁵ wants descriptive research in its field to be characterized by: (a) accuracy, objectivity, and quantitateness; (b) reliable and relevant data; (c) valid standards of comparison; (d) a determination of the relationship of time, place, and cause; (e) accurate and adequate description; and (f) great care in interpretation and in the formation of conclusions.

Any definite listing of desirable criteria for descriptive research in the form of a score card should not be considered to be finally authoritative. It may, however, be concretely suggestive of good standards and procedures in setting up a status check for interpretation of a situation and may be used in the study and analysis of survey and other descriptive research reports. Such a list of criteria has come out of the work of the students in the graduate school of Colorado State

⁷² J. B. Sears, *et al.*, *The Boise Survey*. Yonkers: World Book Company, 1910; *The Arlington School Survey*. University of Minnesota Bulletin. Minneapolis: University of Minnesota, 1921, Vol. XXIV, No. 28; and *Modesto Junior College Survey*. Modesto, California: Board of Education, 1932.

⁷³ J. C. Almack, *Research and Thesis Writing: A Textbook on the Principles and Techniques of Thesis Construction for the Use of Graduate Students in Universities and Colleges*. Boston: Houghton Mifflin Company, 1930.

⁷⁴ H. H. Abelson, *The Art of Educational Research*. Yonkers, N. Y.: World Book Company, 1933.

⁷⁵ P. W. L. Cox, *et al.*, *An Outline of Methods of Research with Suggestions for High School Principals and Teachers*. Washington, D. C.: United States Bureau of Education, Bulletin, 1926, No. 24, 1926.

College of Education in critical reading, group discussion, and in actual research. This is given as Table XII. The expressions of amount in the ten scales were assigned on the basis of the judgments on rank order of several hundred graduate students. The medians of these ranks, transmuted to numerical values,⁷⁶ yielded the figures of column

TABLE XII
A SCORE CARD FOR DESCRIPTIVE RESEARCH

Criteria	Scales		
	Low	Medium	High
I	2	3	4
1. Problem worthy and properly delimited . .	6.0	7.0	8.2
2. Purpose definitely stated but in general terms (a philosophical concept)	5.0	6.1	7.0
3. Reliable data used (objective facts, not opinion)	4.7	5.8	6.3
4. Relevant and valid material selected (not unimportant or useless)	4.5	4.9	5.8
5. Valid standards of comparison used (in similar situations)	4.0	4.5	5.2
6. Accurate description of the place of the investigation	3.5	4.0	4.8
7. Plans (procedures) logical and related to the problem	2.9	3.4	4.2
8. Interpretation pertinent and adequate (local needs—general practice—principles—purpose of the check)	2.4	3.0	3.7
9. Report complete, logical, and in good form	1.5	2.1	3.0
10. Further research provided for (details of the study given—bibliography—related problems not solved listed)	1.0	1.4	1.8
Perfect score (total)			50.0

4, and approximate medium and low scores were placed for convenience of use. It is seen that a perfect total rating would be 50, and a negative judgment might conceivably be in terms of 0 (no value). The scale for each of the ten criteria extends from the zero point to the value given in column 4, three points on each scale being shown.

⁷⁶ C. L. Hull, "The Computation of the Pearson r from Ranked Data," *Journal of Applied Psychology*, 6: 385, 1922; H. E. Garrett, *Statistics in Psychology and Education*. New York: Longmans, Green and Company, 1930, Table XIII, p. 113.

To illustrate the use of this tool for analysis and evaluation, one of the student ratings of a typical county school survey is given (Table XIII). It is seen that, although an attempt is made to justify each score assigned, reasons given are not so pertinent or so complete as they should have been.

D. Summary

A detailed knowledge of possible research methods that may be followed is very desirable when the solution of a problem is undertaken in terms of reflective thinking. Methods and types of research may be classified in terms of the psychological steps of the problem-solving

TABLE XIII
STUDENT RATING OF A COUNTY SCHOOL SURVEY ^a

Criteria	Scores
I	2
1. <i>Problem</i> —This is not definitely stated, but general improvement and "economies" are intimated	6.2
2. <i>Purpose</i> —This is very vague also	5.0
3. <i>Reliability of data</i> —Nine tables and four figures, including two maps, are used	4.9
4. <i>Relevancy and validity of data</i> —Facts presented have rather direct relationship to problems of school organization and school plant	4.6
5. <i>Valid standards of comparison</i> —Data from other Kentucky counties are presented, but none from situations outside of the state	4.2
6. <i>Accurate description of the field of the study</i> —This is rather well done in terms of maps and descriptive data	4.0
7. <i>Logical and pertinent procedures</i> —These are related fairly well to the central problem	3.4
8. <i>Adequate interpretation</i> —This takes the form of good recommendations for better organization and plant, but many worthwhile generalizations do not appear	2.8
9. <i>Complete, logical, and correct report</i> —This is not organized to give a complete, detailed account of research experiences in carrying out the procedures of the survey	1.0
10. <i>Further research provided for</i> —Only a vague suggestion for experimentation is given. There is no bibliography, nor are any unsolved problems listed	0.0
Total rating	36.1
Possible total	50.0

^a L. M. Chamberlin, *A Survey of the School Organization and School Plant of Powell County, Kentucky*. Bureau of School Service Bulletin. Lexington, Ky.: College of Education, University of Kentucky, 1935, Vol. VIII, No. 1.

process, the objective adopted, the area of research entered, the place of the project, relationships of cause and effect, kinds of data obtained as evidence, the subjects used, procedures followed, time values involved, and other criteria. Strictly logical classifications are difficult to find, and may not be at all necessary for research success.

The descriptive method of research is fact-finding with interpretation. It may take many forms, such as the school or community survey; the genetic or continuity check; the case or the case-group study; job and activity analysis, including difficulty analysis; documentary or informational analysis; legal research; and other forms and types of reflective thinking.

E. Research Exercises

1. Select the best of the bases for the classification of research suggested in Section A and make a logical list of methods.

2. Criticize the eightfold classification of research methods and types adopted for this book.

3. Argue that the controlled experiment is the only basic method of creditable research. Prove by illustration.

4. Argue in the same manner for descriptive research, including the longitudinal continuity study.

5. Find and report outstanding examples (a) of unthinking survey, and (b) of creditable descriptive research.

6. Which of the ten scales in Table XII refer (a) to creditable reflective methods in general; and (b) which, to the methods of descriptive research in particular.

7. Which of the ten criteria listed in the score card for descriptive research, given as Table XII, distinguish between creditable reflective thinking and nonresearch methods.

8. Analyze two or three types reports of masters' research projects in the field of descriptive research to determine adequacy of interpretation of findings presented.

9. Do the same with two or three reports of doctors' field-study reports, comparing them with the master of arts theses.

10. Criticize the score card for descriptive research (Table XII), study criteria and standards, suggested in this chapter and elsewhere, and make a better tool for evaluation.

11. List creditable procedures for test-making and criticize the tests used in a number of masters' theses.⁷⁷

12. Use the titles given in Section F of this chapter for further analysis and evaluation of good examples of creditable descriptive research.

⁷⁷ G. M. Ruch and A. D. Stoddard, *Tests and Measurements in High School Instruction*. Yonkers: World Book Company, 1927.

F. Additional Illustrations of Descriptive Research

1. *The Research Survey*

- a. F. P. Bachman, *The All-Year School of Nashville, Tennessee*. Nashville, Tenn.: Division of Surveys and Field Studies, George Peabody College for Teachers, 1931.
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CHAPTER VIII

The Historical Method

DESCRIPTIVE research attempts to interpret the present. It abstracts whatever generalization is possible from cross-sections of current experience. Historical research deals with past experience in a similar manner. Its aim is to apply the method of reflective thinking to social problems, still unsolved, by means of discovery of past trends of event, fact, and attitude. It traces lines of development in human thought and action in order to reach some basis for social activity. Its method is genetic. It is seen, then, that the continuity study (Chapter VII) has a historical point of view, as well as the experiment (Chapter IX), which checks status at different points of change.

A. The Meaning of History

As in all social studies, terminology is confused here. One group of workers argues for the uniqueness of phenomena¹—their unrepeatability. But this would make of the historical report merely a succession of unrelated episodes. It would be unthinking survey of the past without ordered reflection, Baconian induction, what Theodore Roosevelt called a gathering of "bricks and stones." In half-serious vein, Roosevelt wrote:

We have a preposterous little historical organization which, when I was just out of Harvard and very ignorant, I joined. . . . After a while it dawned on me that all of the conscientious, industrious, painstaking little pedants, who would be useful people in a rather small way if they had understood their own limitations, had become, because of their conceit, distinctly noxious. They solemnly believed that if there were only enough of them, and that if

¹ G. V. Langlois and Charles Seignobos, *Introduction to the Study of History*. New York: Henry Holt and Company, 1912, pp. 267-273.

they only collected enough facts of all kinds and sorts, there would cease to be any need hereafter of great writers, great thinkers.²

F. M. Fling, formerly of the University of Nebraska, made this distinction between history and sociology:

When our attention is directed toward the *uniqueness*, the individuality of past social facts, when they interest because of their importance for the *unique evolution of man in his activities as a social being*, in selecting the facts and in grouping them into a complex, evolving whole, we employ the historical method; the result of our work is history. If, on the contrary, we are interested in *what past social facts have in common*, in the way in which *social facts repeat themselves*, if our purpose is to form *generalizations*, or *laws*, concerning social activities, we employ another logical method, the method of the natural sciences. We select our facts not for their individuality or for the importance of their individuality for a complex whole, but for what each fact has in common with others and *the synthesis is not a complex, unique whole, but a generalization in which no trace of the individuality of the past social fact remains*. The result of our work is sociology, not history. Thus the work of the historian supplements that of the sociologist. *The historian is interested in quality, individuality, uniqueness; the sociologist in quantity, in generalization, in repetition.*³

In this discussion of the two concepts, it is apparent that both represent reflective thinking, the investigation of the value of hypotheses so that careful generalizations may appear. The eclectic viewpoint is taken by the late Professor Henri Pirenne of the French Commission Royale d'Histoire, who concludes that true history deals both with the unique and with development, each for the purpose of the interpretation of social relationships.

The subject of historians' study is the development of human societies in space and time. This development is the result of billions of individual actions. But in so far as they are purely individual, these actions do not belong to the domain of history, which has to take account of them only as they are related to collective movements, or in the measure to which they have influenced the collectivity. History is thus allied to sociology and psychology and at the same time it differs from them.

Like sociology, it is interested in the phenomena of the masses which arise from physiological necessities or from moral tendencies which force themselves upon men, such, for example, as nourishment and family solidarity. Like psychology, it is concerned with discovering the internal forces which explain and determine the conduct of an individual. But the comparison stops there. While the sociologist seeks to formulate the laws inherent in its

² Wilson Gee, editor, *Research in the Social Sciences: Its Fundamental Methods and Objectives*. New York: The Macmillan Company, 1929, p. 225.

³ F. M. Fling, *The Writing of History: An Introduction to Historical Method*. New Haven: Yale University Press, 1920, pp. 16-17.

very nature which regulate social existence—or, if one wishes, *in abstracto*—the historian devotes himself to acquiring concrete knowledge of this existence during its span. What he desires is to understand it thoroughly: trace in it all vicissitudes, describe its particular characteristics, bring out all that has happened in the course of the ages to make of it what it has in reality been. For him, chance and the deeds of prominent personalities, of which the sociologist cannot take account, constitute the essential data of his subject. In other words, the sociologist seeks to separate the typical and the general, while for the historian the typical and the general are only the canvas upon which life has painted perpetually changing scenes. The former uses facts only with a view to the elaboration of a theory; the latter considers them as the episodes of a great adventure about which he must tell.⁴

The fact is that there are no truly air-tight compartments in the total range of interest in human welfare. The sociologist, the anthropologist, the political scientist, all social scientists, as well as the natural scientists themselves, are going to the past, as well as operating in the present, in attempts to solve social problems by genetic analysis and reflection. "Social science will stand or fall on the basis of its serviceability to men as they struggle to live."⁵ And the important function of history is its rôle in this total attack on present social problems. It is history as method that is crucial, and to be fruitful this method should be that of true reflective thinking.

B. Thinking Activities

The basic thesis of the preceding chapters has called attention to another essential unity of all types of investigation of natural and social phenomena. The red thread of similarity running through the procedures of effective methods of research is that of reflective thinking. It is highly probable that, in order to be worth while and successful, an attack on the solution of any problem in any field of interest should be in terms of the Dewey-Kelley process of hypothesis, evidence, verification, conclusion, interpretation, and prediction.

To what extent do the actual activities of skillful historians conform to the sixfold act of reflective thinking analyzed in Chapter I and found in operation in Chapter VII in the case of descriptive research? Several authoritative statements of creditable historical procedures are available.

The 1931 report of the Committee on Scientific Method in the Social

⁴ Henri Pirenne, "What are Historians Trying to Do?" Analysis 30 in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, pp. 435-436.

⁵ R. S. Lynd, *Knowledge for What?* Princeton, N. J.: Princeton University Press, 1939.

Sciences of the Social Science Research Council gives informative analyses of "Interpretations of Temporal Sequencies." The method of F. J. Turner in his interpretation of the American frontier⁶ "resembles that of the natural scientist in two distinct ways. For him any conclusion is always extremely tentative." Further, he always attempted "to postulate the largest conceivable family of explanations for a given historical problem, to regard these hypotheses with an unbiased eye, to test them successively by all the available evidence. . . ."⁷ The method of the French historian and philosopher, Ernest Renan, perhaps best known for his *Life of Jesus* (1867), is characterized as "(a) the collection of facts, (b) their elaboration into laws by the methods of induction, analogy, etc."⁸

Very probably one important source of modern historical science is found in the work of Voltaire. His desire and purpose was to write the history of culture in western Europe.

I wish to write a history not of wars, but of society; and to ascertain how men lived in the interior of their families, and what were the arts which they commonly cultivated.

. . . My object is the history of the human mind, and not a mere detail of petty facts; nor am I concerned with the history of great lords . . . ; but I want to know what were the steps by which men passed from barbarism to civilization.⁹

His method was that of meticulous examination of sources and self-education in exposition. He read everything available on the subject in hand, corresponded widely with living witnesses, and rewrote completely as each new edition appeared. He took the student attitude in writing preliminary histories of Russia, Charles XII, Louis XIV, and Louis XIII. His *Essay on the Minds and Spirit of the Nations from Charlemagne to Louis XIII*¹⁰ was epoch-making in historical research, as well as personally. It caused his exile.

"As a historian, whether in prose or verse, he is celebrated for his broad and comprehensive views, his enormous general knowledge (for his time), the vehemence and sincerity of his abhorrence of the mili-

⁶ F. J. Turner, *The Frontier in American History*. New York: Henry Holt and Company, 1921.

⁷ M. E. Curti, "The Section and the Frontier in American History," Analysis 23 in S. A. Rice, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, pp. 356 ff.

⁸ Jean Pommier, "The Historical Method of Ernest Renan," Analysis 27 in S. A. Rice, *op. cit.*

⁹ H. T. Buckle, *History of Civilization in England*. New York: D. Appleton-Century Company, 1901, Vol. 1, p. 580.

¹⁰ F. M. A. de Voltaire, *Essays and Criticisms*. New York: Peter Eckler Publishing Company, 1901.

tary spirit, his savage hatred of the religious *culte*, and his inimitably interesting style. Until his day the learned rarely had wit, and the witty rarely had learning. Voltaire set an example which has been singularly little followed: he made facts more amusing than fiction."¹¹

Finally, the work of a modern historian may be cited. The method of J. T. Adams¹² was analyzed in Chapter I. It was seen that: (a) he is impelled toward historical investigation out of a background of family experience and personal research; (b) this constant urge compels him to attack specific problems in the field of his interest; (c) a definite prophetic attitude is taken toward possible solutions; (d) these tentative philosophies are elaborated in terms of whatever evidence is obtainable from analysis of research; (e) generalizations are corroborated on the basis of knowledge about actual past human experiences; and (f) finally, all conclusions are evaluated in terms of possible permanency of values in time and place.

It is seen that the essential procedures of reflective thinking are suggested in these analyses. It is descriptive research (Chapter VII) dealing with narration (survey) and interpretation of data of the past. It is history. The distinction between this method and the direct observation of other scientific processes is carefully given by H. C. Hockett of Ohio State University.

Historians have reached substantial agreement that their subject is not a science, in the sense at least in which chemistry and physics are sciences, because their procedure is necessarily different from that of scientists who employ the methods of *direct* observation. However, the work of the historian, no less than that of the scientist, must rest upon reliable observation. The difference in procedure is due to the fact that the historian usually does not make his own observations, and that those upon whose observations he must depend are often if not usually trained observers. Historical method, strictly speaking, is a process *supplementary* to observation, a process by which the historian attempts to test the truthfulness of the reports of observations made by others.

Modern historians are scientists in the sense that they share the scientific spirit in seeking to apply critical principles as instruments in attaining trustworthy results, that is, in building up a body of dependable information. Although, unlike the other subjects mentioned, history is not a science of direct observation, it shares with them the use of hypothesis. Scientific method may be described as consisting essentially of three processes: observation, hypothesis, and experiment. The latter two are really only phases of the process of observation. A hypothesis is a tentative generalization or

¹¹ S. G. Tallentyre, *The Life of Voltaire*. London: G. P. Putnam's Sons, 1903, p. 568.

¹² J. T. Adams, "My Methods as a Historian," *Saturday Review of Literature*, 10, No. 50: 777, 778, 1934.

conclusion, resulting from observation, and used to guide further observation, in the light of which it is likely to be modified. The further observation often takes the form of experimentation, which may be described as controlled observation. The form of the experiment, moreover, is dictated by the hypothesis. All three processes are thus phases of systematized observation. Contrary to popular notions, the scientist does not proceed with his feet constantly upon the solid rock of ascertained fact. A part of the time he must be formulating and testing hypotheses or he could not proceed at all. Scientific thinking is always in advance of scientific knowledge, and leads the way to new truths.

In a similar way the historian examines his data and formulates hypotheses or tentative conclusions. These send him back, not to make new observations or experiments, but to find fresh evidence, and this process is continued until, in the light of all obtainable evidence, the hypothesis is abandoned as untenable, established as true, or modified until it becomes a conclusion actually supported by the evidence.¹³

Representative of creditable historical biography, the method of Harold Nicolson may be taken. His personal analysis is quoted in Chapter II. His procedures are: (a) "a congenial subject," (b) making "an enormous notebook" of secondary material, (c) doing "original research" among available documents, (d) "visiting the localities identified with the subject of your biography," (e) "block out the headings of the several chapters," and (f) write—in the light of his philosophy of history. This interpretative point of view is stated as follows:

"Human error is a constant, and not an incidental, factor in history. Everybody is an ass sometimes, and most people are asses all the time. Human will power is an intermittent factor, and history has been made more frequently at moments when people had no idea what they wanted than at those rarer moments when some individual wanted something definite. We are all straws upon the stream: yet if one observes those straws they do not all behave in exactly the same manner." Were I to define my philosophy of history I should, I suppose, define it in some such terms.¹⁴

Are the historical novelists and the writers of novelized biographies doing research? A brief examination of their methods may have the value of the "difficulty analysis," in providing information on attitudes and techniques to avoid. It may furnish also some "horrible examples" of bad historical writing, and thus point more forcefully toward good methods of historical research.

¹³ H. C. Hockett, *Introduction to Research in American History*. New York: The Macmillan Company, 1932, pp. 57-58.

¹⁴ Harold Nicolson, "How I Write Biography," *Saturday Review of Literature*, 10: 709-711, 1934.

Hervey Allen's defense of historical romance is apropos. His method in general is stated thus:

After all, how do people who are given to grouching about the use of historical sources suppose that a novel like *Anthony Adverse* can be written? It is placed in time considerably over a century ago. The author, of course, was not alive then. Nor is there anyone left who was. Is the author, then, supposed to go into a trance and return with his story verbatim by some mystic intuition or "inspiration"? Or does he, like all the tribe of historical novelists before him, find that verisimilitude of the intricacy of incident in times past in the written records, the books, diaries, letters, and documents of the era which he is depicting? Of course he does—because he must.¹⁵

Stating specifically what his "sources" were, Allen says that two thirds of the book came directly out of his imagination and not from literature or history. He engaged in no research. However, he did read for general outlines of background—the life of Nelson, for example, in order to be certain about the harbor at Leghorn in 1796. Several old Italian books gave minute details of location and event also. In fact, reading was voluminous about the West Indies, about New Orleans, New Mexico, and Africa. "I read mostly all night, and with complete absorption. Morning was always a surprise to me. I sometimes go through two fair-sized books in a night."¹⁶

Hervey Allen does not claim that his method is scientific, that he is engaged in research. In fact, in order not to give a wrong impression, it was decided not to include an introduction and a bibliography in his book. This is quite contrary to the policy followed in a novelized biography of John Ruskin, which is minutely documented.¹⁷

Another modern writer of novels of ancient life has recently described her motive and methods:

I always wonder how other historical novelists write their books. Do they write them scientifically and sensibly, or just accidentally, the way I write mine? I wonder if they go to museums, and suddenly see something which catches the breath, which gets at one, which is a story. There was, for instance, the museum at Oslo in Norway, the only place where one can still see a Viking ship, dug up from the grave mound where it covered the body of a sixth century chief, preserved and exquisitely repaired by the loving and intelligent care of experts; that ship got me. It was beautiful, it had long, slim, fierce lines, and it was intensely practical—functional, we should say nowadays. I prowled round it, making notes, carefully weighing up just how the strakes were fastened together, just how the steering paddle was

¹⁵ Hervey Allen, "The Sources of *Anthony Adverse*," *Saturday Review of Literature*, 10: 401, 1934.

¹⁶ Hervey Allen, *op. cit.*

¹⁷ Amabel Williams-Ellis, *The Exquisite Tragedy*. New York: Doubleday, Doran and Company, 1929.

attached, realizing the amount of force it would need to hold that boat on its course in a good wind. From that boat I went on to look at contemporary Viking carvings; again I peered and took notes and rough measurements, even made little drawings, unintelligible to anyone but myself. For an afternoon I moved happily through Oslo, and the ship made itself into a story—a story called “Spring” in *The Delicate Fire*.¹⁸

Other accidental things came into that story—the snow among the pines on the hills above Oslo, and the footsteps of animals which I didn’t know. Earlier on I had been reading some Viking history and folk tales, but none of it had stuck in my mind except for a few names, and it was these names which joined up with the ship and the snow to make a picture in my mind so vivid and so insistent that it had to be written down.¹⁹

It seems to be clear that the reputable writer of historical fiction does not claim accuracy of fact nor unbiased interpretation. What he writes is largely a product of personal imagination. It is literature, not history. But perhaps the case of the writer of novelized biographies is not so free from guile. Also, inaccuracy at times is found in the books of reputable historians. However, as in the case of T. B. Macaulay in his *History of England*, this may have been the result of lack of availability of sources or of ignorance of modern methods of historical research. There is, of course, the exceptional case of the English historian, J. A. Froude, who, although a critic on methodology, suffered from “Froude’s disease” and could not describe accurately a place recently visited.²⁰ Although this “disease” is very probably not widespread, other examples might be cited. There is that of H. T. Buckle who, in his English history,²¹ undoubtedly was arguing from a preconceived personal philosophy. Another case of the bias of attitude, if not prejudice, is found in H. C. Lodge’s *Alexander Hamilton*,²² which suffered from the author’s obsession that the Republican Party was the heir of Federalism.

Bernard DeVoto shows that such preconceptions often descended to outright dishonesty, when there was an attempt to make biography literature. He concludes that “Literary people should not be per-

¹⁸ Naomi Mitchison, *The Delicate Fire*. New York: Harcourt, Brace and Company, 1933.

¹⁹ Naomi Mitchison, “Writing Historical Novels,” *Saturday Review of Literature*, 11: 645–646, 1935.

²⁰ G. V. Langlois and Charles Seignobos, *Introduction to the Study of History*. New York: Henry Holt and Company, 1912, p. 125.

²¹ H. T. Buckle, *History of Civilization in England*. New York: D. Appleton-Century Company, 1901.

²² H. C. Lodge, *Alexander Hamilton*. Boston: Houghton Mifflin Company, 1909.

mitted to write biography."²³ However, this disability may be after all only "simple ignorance." But DeVoto implies that it often is willful. It may be the result of omission of evidence, an inordinate desire to "debunk," or to "interpret" like the medieval philosophers on a basis of no-fact. Cases in point may be Merezhkovskii's "romance," and the imaginative accounts of Ludwig, Maurois, Strachey,²⁴ and others. These are interesting as literature, but misleading to the nonscientific lay reader. They do not deal exclusively with the details of established fact.

REFLECTIVE THINKING IN HISTORICAL RESEARCH

Thinking Steps

Agendum Procedures

1. The feeling of need.	1. This came out of a recognition of the desirability for curriculum data for high-school use on the principal industry of the region.
2. The problem.	2. What are the pertinent materials and information on the development of the sugar beet industry in northeastern Colorado and how may they be organized for use as local history in the senior high school?
3. The hypothesis.	3. This is a composite of tentative conclusions on developmental trends and on types and sources of available data, together with planned procedures for collecting and classifying them.
4. The evidence.	4. Here the tentative theories are elaborated in terms of pertinent evidence on their value and in the light of their implications as supplementary reading matter on local history.
5. Experimental verification.	5. The classified course content is here subjected to experimental verification by actual tryout as an organized segment of a high-school history curriculum.
6. Appraisal for future needs.	6. Here a final judgment is reached, based on the experimental tryout, on the value of the material, coming out of research, as permanent course content.

²³ Bernard DeVoto, "The Skeptical Biographer," *Harper's Magazine*, 146: 180-192, 1933.

²⁴ D. S. Merezhkovskii, *The Romance of Leonardo da Vinci*. New York: G. P. Putnam's Sons, 1901, Chapter II, Vol. II; Emil Ludwig, *Napoleon*. New York: Boni and Liveright, 1926; Andre Maurois, *Ariel: The Life of Shelley*. New York: D. Appleton-Century Company, 1924; and *Disraeli: A Picture of the Victorian Age*. New York: D. Appleton-Century Company, 1929; G. L. Strachey, *Elizabeth and Essex*. New York: C. Gaige, 1928; and *Queen Victoria*. New York: Harcourt, Brace and Company, 1921.

These analyses of the actual activities of historical writers, and by contrast of pseudo-historians, reveal their method, when successful, to be that of ordered reflective thinking. There is an urge, basic and deep, an ultimate-ultimate objective (Chapter V), which merges as a specific purpose and aim to solve some crucial problem of human relationship. Pertinent evidence is sought on the value of likely solutions, which become concluding generalizations of more or less permanent value for prognosis. The scientific historian, however, keeps even these open-mindedly tentative, for modification on the discovery of additional and better sources, which may furnish more evidence.

A simple illustration of this parallel between the six steps of reflective thinking and actual historical research may be taken from the report of a graduate student working toward the master's degree.²⁵

C. The Historical Research Project

A suggested form for the organization of historical research studies was given in Chapter V. Seven agendum procedures, coming out of experience in the Division of the Social Studies, Colorado State College of Education, were listed: (1) the problem, (a) its statement, (b) type of problem; (2) analysis of the problem; (3) securing the data; (4) manipulation and interpretation of data; (5) checking your data for reliability; (6) writing the thesis; and (7) probable rate of progress.

Several historical research manuals analyze the student research project in terms of definite steps. F. M. Fling discussed the problem of *The Writing of History*²⁶ under seven heads: (1) choice of a problem, (2) collection of material, as evidence for its solution, (3) classification of material, (4) criticism of sources on the basis of genuineness, localization, and independence, (5) establishment of facts, (6) synthesis, or grouping of facts for interpretation on the basis of cause and effect relationships, and (7) exposition of findings. H. C. Hockett of Ohio State University lists good procedures as follows: (1) choosing a subject, (2) gathering data, (3) formulating tentative conclusions, hypotheses, (4) external (lower) criticism of data, (5) internal (higher) criticism, to determine the meaning of data (interpretation), and (6) historical composition.²⁷

Allan Nevins of Columbia University, in a twenty-four page pam-

²⁵ H. W. Hugener, *A History of the Beet Sugar Industry of Northeastern Colorado*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1927.

²⁶ F. M. Fling, *The Writing of History: An Introduction to Historical Method*. New Haven: Yale University Press, 1920.

²⁷ H. C. Hockett, *Introduction to Research in American History*. New York: The Macmillan Company, 1932.

phlet addressed to graduate students, gives concrete directions for historical research under the following heads: the search for a topic, the working plan, collection of material, note-taking on materials, the synthesis of materials, details of style, footnotes, and bibliography.²⁸ He suggests elsewhere²⁹ that creditable historical research should be in terms of the five laws of logical induction, as outlined by J. S. Mill.³⁰ These canons are given in full in Chapter IX.

A specific illustration of the actual handling of a historical event is found in Volume VI of a recent historical series.

In the writing of this narrative of the nomination of Harding, the process began with composing a first draft. In making this, the ordinary sources were searched, the official proceedings of the Republican National Convention at Chicago in 1920, newspaper files covering the months of the pre-nomination campaign and during the week of the convention, the reports of certain Senate investigations and parts of the Congressional Record containing relevant material, the biographies, autobiographies, and other books that deal with or allude to the convention and the nomination. The material thus garnered was united with material of my own, notes I had made at the time, correspondence I had had, newspaper despatches I had written. Out of all this the first draft was made. . . .

Examination of these letters, comparison of each with each and of all with my own early draft, sifting out what was corrective, or new, or otherwise relevant and important; and weaving the additions and modifications into my own text—that constituted, in large part, the final writing of the chapter.

This is not an easy method of writing history, but it is very much worthwhile; indeed, I think it is a superior method. By no possibility could a complete or fully accurate account of the events covered by this chapter be achieved, if the writer were confined to the documents and other printed records. Much of the most important, the most decisive, of what happened was never put on record. Not that there was, in the present case, any great reason for concealment; it was merely that decisive episodes occurred in word-of-mouth conversations, which there was no occasion to put on record.

The method of writing history which combines the formal records with the recollections of participants and eye-witnesses results in greater accuracy than any other. But it is a method which on occasion causes the historian's person to become, so to speak, a bloody battleground, upon which contending witnesses struggle to make their varying versions "stick." Mere dissonances of memories are comparatively easy to reconcile. But it sometimes happens that a participant in events has urgent reason to try to have his version accepted. The place of a man in history, the esteem of posterity for him—

²⁸ Allan Nevins, *Masters' Essays in History*. New York: Columbia University Press, 1933.

²⁹ Allan Nevins, *Gateway to History*. New York: D. Appleton-Century Company, 1938, p. 215.

³⁰ J. S. Mill, *A System of Logic*. New York: Harper & Brothers, 1873, p. 222.

in some cases his escape from obloquy—may depend on his persuading history to accept his account of what he did and why. With almost equal frequency, it happens that another participant has equally urgent reasons to have a contrary version accepted. Such contradictions of assertion, accompanied by almost passionate insistence of each upon his own version, have led to strong argument, with the historian in the role of at once umpire and arena. About handling such situations, there can be no standard technique. Most of them present no insuperable difficulty, for almost always one version or the other is so supported by evidence from other sources that the historian, who alone has brought all the facts before him, is able to say which is correct. When the facts of any situation are completely assembled, they usually compose a pattern, a picture, in which it is as difficult for an inexactness to find a place as for an alien piece to be fitted into a jig-saw puzzle.⁸¹

D. The Evaluation of Historical Reports

Judgments on the value of historical writing may be in terms of the meaning of historical research and the more or less standardized procedures discussed in the previous sections of this chapter. Are the details of the report found to be in conformity with Henri Pirenne's analysis of history as science? Is there evidence in the final connected story that problem selection, hypothetical assumptions, criticism of sources, and interpretation of meanings have followed the actual things done by reputable historians and have avoided the superficialities and errors of fiction writers?

As in the case of the evaluation of descriptive research (Chapter VII), the most important, all-inclusive criterion asks the question, Has the historical process, as shown in the finished report, followed the method of actual ordered mind activity? Has it been a process of reflective thinking? But the terminology of progress through this act of reasoning is somewhat different in each method or type of research engaged in. In historical research, there is a characteristic list of things to be done, if the learner would be successful in producing a finished piece of historical writing.

As in all reflection, a definite order and time sequence cannot be assumed. It may even be that a feeling of need may not be present nor a specific problem catch the attention of the student, until much reading has been done in a more or less scattered, purposeless, Baconian inductive manner. But when a definite problem, or "subject," as it is usually called, does appear, as a result of personal experience or adviser suggestion, then the collection and organization of material, old and new, becomes a centralized effort in terms of

⁸¹ Mark Sullivan, *Our Times; The United States, 1900-1925; The Twenties*. New York: Charles Scribner's Sons, 1935, pp. 69-71.

hypotheses tentatively adopted about the solution of the problem of human relationships under attack.

The choice of a subject problem is, of course, basically important. Teachers of historical research differ about this. It has been advocated that, in the case of the inexperienced student, the problem should be set by the instructor, should be the same for all members of the class, and need not be new.³² This is on the theory that the beginner is only learning the elements of method and techniques anyway, and what he uses as his vehicle of experience does not matter. It is believed that this is too naïvely close to a total dependence on transfer, too sincere advocacy of the assumed values of formal discipline. It is thought that, in the case of graduate students, something more intimately connected with personal interests and ability should be permitted. The neophyte's problem should emerge out of the background of all of his reading experiences, past and present, and should give opportunity for original research. Careful advice, however, should be given about a reasonable scope. The natural tendency at first to conceive of the project in very broad terms may be guided into a specific corner of the total field, where a feasible ultimate objective can be adopted (Chapter V).

Now tentative conclusions begin to come to the student's mind on a solution of the problem in hand. These are hypotheses, and their function in well-ordered historical research is to guide bibliographic activities, so that they may not be too purposelessly scattered. They constitute the ultimate objective of the study.

Most often the worker will need to make a thorough review of secondary publications bearing on the project undertaken, and may even need to do much additional background reading, or enroll in basic courses that he has not taken. These essential prerequisites are related to his working bibliography (Chapter IV). But very soon reading, guided by carefully set up hypotheses, should become more definite, with a purpose of obtaining evidence on their worth.

Criticism deals first with the value of documents that appear for analysis and use. This is external (lower) criticism. It forms judgments on the probable circumstances of their origin by internal analysis, and by comparison with other material available. Its purpose is to detect anything spurious. Then comes textual examination, which seeks to discover corruptions and changes that may have occurred.

But internal (higher) criticism is most essential. This aims to get a final judgment on the actual meaning of data gathered, to interpret statements emerging from textual analysis. Here tests of competence

³² F. M. Fling, *The Writing of History: An Introduction to Historical Method*. New Haven: Yale University Press, 1920.

and of truthfulness are applied, as well as tests for anonymity. In brief, the aim is to ascertain the actual facts. Negative criticism rules out many facts as not ascertainable, but certain types may be used. These may come from incidental allusions, contemporary writings, carefully handled details that seem to be contradictory, and from statements that fit into the pattern of other established data.

TABLE XIV
A SCORE CARD FOR HISTORICAL RESEARCH

Criteria	Scales		
	Low	Medium	High
I	2	3	4
1. The problem should be worthy of investigation	6.0	7.0	8.2
2. Sources should be assigned to definite authors, places, and times (localized through higher criticism)	5.0	6.1	7.0
3. The study should be limited and feasible in terms of research ability	4.7	5.8	6.3
4. The report should be in logically organized English narration and exposition	4.5	4.9	5.8
5. Interpretation of facts reported should be adequate	4.0	4.5	5.2
6. Sources should be adequately original, as well as secondary	3.5	4.0	4.8
7. Sources should be genuine and reliable (lower, or textual, criticism)	2.9	3.4	4.2
8. The report should make possible further research	2.4	3.0	3.7
9. The study should be limited as to time and money costs ^a	1.5	2.1	3.0
10. Facts should be verified by at least two independent witnesses	1.0	1.4	1.8
Perfect score (total)			50.0

^a H. V. Allen, *The Cost of the Master's Education in a State Teachers College*. Greeley, Colorado: Unpublished Master of Arts Thesis, Colorado State Teachers College, 1933.

The outline for the final report should begin to take form early in the thinking experience of the research worker. Before actually sitting down to write, he should prepare a definite list of chapter titles

and section heads (Chapter V). If these have been subject to revision throughout all previous steps of reflection, they may now be in probable final form. However, an open mind should still be maintained toward their actual value. It may be that adjustments among points and

TABLE XV
STUDENT RATING OF A HISTORICAL RESEARCH REPORT ^a

Criteria	Criticism	Score
1	2	3
1. The problem should be worthy of investigation.	1. Worthy because of its stimulus to civic pride and its use in social science instruction in the Denver public schools. No universal value.	7.5
2. Sources should be assigned to definite authors, places, and times (localized through higher criticism).	2. Localized in Denver, dealing with persons and documents of that place only.	6.8
3. The study should be limited and feasible in terms of research ability.	3. It deals with only the one project in the one city.	6.3
4. The report should be in logically organized English narration and exposition.	4. There is good sentence structure, variety, and coherence.	5.0
5. Interpretation of facts reported should be adequate.	5. The interpretation is rather inadequate.	3.0
6. Sources should be adequately original, as well as secondary.	6. Sources are largely original.	4.7
7. Sources should be genuine and reliable (lower, or textual, criticism).	7. They are city files, old newspapers, municipal facts of the city, etc.	3.5
8. The report should make possible further research.	8. There is possibility of continuity of research as the center develops.	4.0
9. The study should be limited as to time and money costs.	9. The total of time and money used was near to the norm for all prospective masters of art.	2.5
10. Facts should be verified by at least two independent witnesses.	10. They are checked by the use of a variety of sources, such as records of the city, pictures, interviews, and the like.	1.0
	Total score	44.3
	Possible score	50.0

^a Mary E. Gillis, *A History of the Civic Center of Denver*. Greeley, Colorado: Unpublished Master of Arts Thesis, Colorado State Teachers College, 1929.

segments of discussion and interpretation may be needed, even after large portions or all of the final report has been written. Last of all, the entire production should be gone over for details of style. The report should be readable as well as accurate. It should finally appear as acceptable historical literature in conformity with the best English usage.

As in the case of the descriptive method, a student organization of criteria for acceptable historical research, as appearing in the final report, is given as Table XIV. The details of the score card should be considered open-mindedly, and perhaps it should be revised as suggested in Chapter VII. It is the product of much revision by previous student groups. No doubt further desirable change may be suggested. Table XV illustrates the use of this list of criteria in terms of a student rating of a specific piece of historical writing. Note that points of criticism (column 2) are not as fully stated as they might be. They should justify scores assigned in column 3.

E. Summary

Historical research interprets past trends of attitude, event, and fact. From one point of view, history deals with unique phenomena, collected and reported without ordered reflective thought. But creditable research in the field of history is interested in what past social facts have in common, how they repeat themselves, and what generalizations can be made to emerge from reasoning.

The research activities of reputable historians, both teachers and writers, conform to the sixfold process of reflective thinking, as analyzed by Dewey and Kelley. Emerging from an urge that peaks up to a definite problem, good evidence is sought on the value of hypotheses on solution. Generalizations resulting are verified both inductively and deductively, and their value investigated for prediction.

A score card of criteria for historical research may include such items as worth of the problem, genuineness and reliability of sources, logical organization of the report expressed in good English narrative and exposition, adequate interpretation of facts found, verification of data used, original sources as well as secondary, sources localized through the technique of higher criticism, the possibility of further research recognized, and a limitation of the cost of the project in terms of time and money.

F. Research Exercises

1. Report on a piece of historical writing that adheres strictly to the "unique event" theory.

2. Show that the work of the best historians is in terms of reflective thinking.
3. Is history a science? ³³ Reply by illustration.
4. Illustrate from a historical report how the gathering, classification, and interpretation of evidence is guided by hypotheses set up.
5. Is it ever necessary for graduate students to use secondary sources in historical research? Illustrate.
6. Illustrate the difference between lower and higher criticism in a particular historical report.
7. Give three good problems for historical research, to be attacked by a graduate student. Three for a scientist like James Bryce.³⁴
8. Does this problem suggest historical research? "What are the best methods of teaching current events to elementary school children?"
9. Is novelized biography history? Illustrate.
10. Are biography and autobiography ever history? Illustrate.
11. Can historical writing be literature and at the same time good history? Illustrate.
12. What does style mean in historical writing? Illustrate.
13. When should an outline of chapter titles and section heads be made in historical research?

G. Additional Illustrations of Historical Research

1. Estella J. Bennett, *A Study of Dakota Territory of 1861 and Wyoming South of the Forty-third Parallel*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930.
2. J. L. Bishop, *The Historical Method of Research in Education*. Unpublished Master of Arts Thesis, Department of Education. University of Colorado, 1935.
3. R. F. Butts, *The College Charts Its Course: Historical Conceptions and Current Proposals*. New York: McGraw-Hill Book Company, 1939.
4. T. M. Deam, "Evolution of the Joliet Junior College," *Junior-College Journal*, 1:429-432, 1931.
5. W. S. Elsbree, *The American Teacher: Evolution of a Profession in a Democracy*. New York: American Book Company, 1939.
6. N. A. Gant, *A History of the Texas Boundary Disputes*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930.
7. H. B. Hough, *Country Editor*. New York: Doubleday, Doran and Company, 1940.

³³ Thomas Woody, "Of History and Its Method," *Journal of Experimental Education*, 15: 175-201, 1947; H. G. Good, "The Possibilities of Historical Research," *Journal of Educational Research*, 29: 149, 1935.

³⁴ James Bryce, *Modern Democracies*. New York: The Macmillan Company, 1921, Vols. I, II.

8. E. W. Knight, *Twenty Centuries of Education*. Boston: Ginn and Company, 1941.
9. Margaret Leech, *Reveille in Washington, 1860-1865*. New York: Harper & Brothers, 1941.
10. Paul Monroe, *Founding of the American Public-School System: A History of Education in the United States from the Early Settlements to the Close of the Civil War Period*. New York: The Macmillan Company, 1940.
11. Gertrude H. Reini, *A History of the National Forests in Colorado*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.
12. K. L. Roberts, *Oliver Wiswell*. New York: Doubleday, Doran and Company, 1940.
13. A. C. Schock, "The Selectivity of the Philadelphia Central High School (1846-1865) and the Hartford Public High School (1848-1865)," *Journal of Educational Research*, 23: 232-237, 1931.
14. Gaetano Salvemini, *Historian and Scientist*, Harvard Press, 1939, reviewed by Jacques Barsun, "The Uses of History," *Saturday Review of Literature*, 21:8ff, 1939.
15. G. M. Trevelyan, *Clio, the Muse and Other Essays*. New York: Longmans, Green and Company, 1930, p. 404.
16. Robert Van Gelder, "Writing Biography and History," (Allan Nevins) *New York Times Book Review*, p. 2, July 21, 1940.

CHAPTER IX

The Experimental Method

DESCRPTIVE research deals with the present status of variables in the natural science and the social science realms. A cross-section check in any situation furnishes evidence on the value of the hypothetical solution of problems recognized with the purpose of obtaining generalized knowledge for future use. If present time is lengthened so that change, maturation, or development occurs, reports of status at points of time progress may be made. Attitude and activity then become experimental. Generalizations emerging are more valuable, because by means of them it becomes possible to control reflective thinking and conform more nearly to the known methods of normal mind activity (Chapter I). It will be recognized that this is the case in the genetic continuity study illustrated in Chapter VII. If variables dealt with there can be controlled so that the experimental factor is isolated for measurement of its change, true experimentation occurs. It is the method of experimental research.

A. Definition of Experimental Research

A skillful dentist recently said, "I am not interested so much in the mechanical skills of filling and pulling, as I am in the larger problems of change and improvement in my profession. I get constantly, from our meetings and our journals, concrete suggestions which I have not had time to develop from the beginning, because I have to earn a living. But I take the tried experimental methods which I learn about and apply them in the solution of problems as they come up. This makes me a better dentist year by year." This man is helping to make dentistry a true profession. He has an open-minded, scientific attitude toward his problems.¹

¹ F. L. Whitney, "The Experimental Attitude in Education," *Teachers Journal and Abstract*, 4: 374, 1929.

This experimental attitude, illustrated in Chapter II, is basic in the thinking of the scientist in the natural and the social realms. Even the preliminary step in reasoning will not occur without it, because a feeling of need, a recognition of deficiency and possible improvement, will not come to the closed mind. The fact that this is fundamental in human progress and in education is proved by its early origin. Even before the scientific revival under Francis Bacon, western Europe had produced a Vittorino da Feltre, whose experimental school was strangely modern in attitude and method. This has been followed in American modern times by the "child-centered" schools of F. W. Parker (1875 and 1883), John Dewey (1901), Mrs. Emmons Blaine (1901), J. L. Meriam (1904), Abraham Flexner (Lincoln School of Teachers College, Columbia University, 1917), and many others recently.² Early roughly controlled experiments in the field of education were conducted by J. B. Basedow, J. H. Pestalozzi, J. F. Herbart,³ and others. In the early twentieth century, the possibility of controlling experimental conditions in public education was suggested in J. M. Rice's surveys;⁴ and tools for the measurement of factors involved began to be invented by Alfred Binet, L. M. Terman, A. S. Otis, E. L. Thorndike, and the other test makers. Laboratory research in psychology began with Wilhelm Wundt in Leipzig in 1878, and was brought to this country by such American educators as C. H. Judd and J. M. Cattell.

In the natural science field, development of the experimental attitude may be traced from the time of Aristotle and Archimedes, through Galileo's work with the motion of bodies, Isaac Newton's gravitation studies, William Harvey's discovery of blood circulation, Antoine Lavoisier's work in chemistry, Michael Faraday's pioneer inventions in electricity, and Charles Darwin's evolution theories, to the time of Louis Pasteur, Joseph Lister, and the moderns.

The philosophies and work of men such as these (Chapter II) illustrate the experimental method and give information about the details of its procedures. The Columbia associates in philosophy suggest the transition from rather rough observation of phenomena to

² C. H. Thurber, "Vittorino da Feltre," *School Review*, 7: 295-300, 1899; Harold Rugg, *That Men May Understand*. New York: Doubleday, Doran and Company, 1941, pp. 300-303.

³ R. H. Quick, *Essays on Educational Reformers*. New York: D. Appleton-Century Company, 1893; J. F. Herbart, *Outlines of Educational Doctrine*. New York: The Macmillan Company, 1901.

⁴ J. M. Rice, "Causes of Success and Failure in Arithmetic," *Forum*, 34: 437-452, 1903; and *Scientific Management in Education*. New York: Hinds, Noble, and Eldredge, 1912, Chaps. V, VI.

controlled experimentation, and state the possibility for effective reflective thinking by this method as follows:

When we can provide for the repetition of an event, such as the reaction of zinc to an acid, under controlled conditions, we can gain a greater understanding of what is taking place than when our powers of observation are restricted as in the case of psychological influences. By means of experimental investigation, our preliminary observations, even in very complex fields, are improved and corrected, and, as we perfect our methods of studying these subjects, we may reasonably hope to learn more about them, even about such complex subjects as the nature of life and the factors in mental development. The advance in various sciences has depended largely on the discovery of more applicable methods of experimentation whereby various theories might be tested and further facts secured for their subsequent elaboration.⁵

Creditable experimental research has to do with controlled observation of change and development, whether in the realms of the natural or the social sciences. Adequate control is the essential factor of the method used. The law of the single variable must be satisfied in every experimental situation. "The great rule is to vary only one circumstance at a time, and to maintain all other circumstances rigidly unchanged."⁶ After the experimental factor has been chosen and defined carefully, it is permitted to operate in one individual or group, in contrast to related factors in other identical situations. In natural science, outstanding examples of this method have been analyzed in Chapter II. Louis Pasteur performed a perfectly controlled experiment with his crooked-necked bottles, and I. P. Semmelweis and Joseph Lister applied an identical method to the problem of wound suppuration.

In the natural sciences, observation merges into experiment when an experimental factor acts so that hypotheses may be tested in terms of change and control. Claude Bernard characterizes this process as follows:

Two things must, therefore, be considered in the experimental method: (a) The art of getting accurate facts by means of rigorous investigation; (b) the art of working them up by means of experimental reasoning, so as to deduce knowledge of the law of phenomena. We saw that experimental reasoning always and necessarily deals with two facts at a time: Observations, used as starting point; experiment, used as conclusion or control. . . .⁷

⁵ Laurence Buermeyer, *et al.*, *Columbia Associates in Philosophy, An Introduction to Reflective Thinking*. Boston: Houghton Mifflin Company, 1923, p. 65.

⁶ F. W. Westaway, *Scientific Method: Its Philosophical Basis and Its Modes of Application*. New York: Hillman-Curl, 1937, p. 196.

⁷ Claude Bernard, *Introduction to the Study of Experimental Medicine*. New York: The Macmillan Company, 1927, p. 13.

The procedures of experimental research in the social science field are characterized in an analysis of the English fatigue studies.⁸

It is sometimes questioned whether experimentation within social science carries the same meaning and implications as experimentation within "natural" science. In the study here examined, a positive answer may be given.

A given set of working conditions is made up of a large number of potential variables. In such a set of conditions, certain workers were carrying on certain tasks with certain measured end results in output. By introducing a single determinate change in the working conditions, all other potential variables being so far as possible held constant, determinate differences in the end results were observed. By universal scientific custom, the change in conditions may be regarded as having "produced" the change in end results.

It may be objected that in spite of all precautions certain variables were uncontrolled. This is probably true, as has been pointed out above. The experiment assumed that but for the introduction of the rest period, the same output would have appeared in the second three weeks as in the first. It is sure that this would not have been the case *precisely* because of these uncontrolled factors.

Nevertheless, the assumption made is less subject to error than any other. Uncontrolled variables cannot be wholly eliminated from experiments in the natural sciences, and in consequence a margin of error must always be taken into account. No quantitative determination of the magnitude of this error has been made by the authors, and the effort would no doubt prove difficult if not insuperable. Common-sense judgment appears to replace quantitative expression in support of the probability that the possible error would not equal or exceed the numerical differences attributed to the experimental variable. Yet there is no difference in principle between this experiment and one in physics or chemistry.⁹

As Germany inaugurated the psychological experiment with individual subjects at the University of Leipzig (1878) and in Ernest Meumann's emphasis on laboratory technique, so one finds there later the transition to experimental study of group learning in the actual school situation. This movement foreshadowed the modern American learning-by-doing program and looked toward John Dewey's emphasis on social education. The doctor's thesis of W. A. Lay at the University of Halle (1903), *Experimental Didaktik*, discriminated between the psychological experiments and educational experimentation and advocated both the activity school (*Totschule*) and "the school of living community" (*Lebensgemeinschaftschule*).

⁸ S. E. Wyatt and J. A. Fraser, *Studies in Repetitive Work with Special Reference to Rest Pauses*. London: Great Britain Industrial Fatigue Research Board, 1925, Report 32.

⁹ S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, p. 692.

In educational research, this movement stood for school experimentation and application *in situ*, with the purpose of improving the learning process. The procedure included (a) the "formulation of a working hypothesis," (b) the selection of "particular problems" for attack, (c) actual controlled experimentation in the classroom, including the preliminary experiment in order to define the problem and narrow the field of inquiry of the real experiment, and "the control or check experiment," and (d) "the verification of experimental didactical results in actual classroom life."¹⁰

Educational experimentation is correctly defined by W. S. Monroe and M. D. Engelhart of the University of Illinois in the following manner:

"Experimentation" is the name given to the type of educational research in which the investigator controls the educative factors to which a child or group of children is subjected during the period of inquiry and observes the resulting achievement. . . . In the simplest type of educational experiment the investigator seeks to evaluate the influence of some one educative or "experimental" factor on a single group of children. He must start the experiment with some measurement of the initial attainment of the children in the trait or ability to be influenced. He then subjects the group to the experimental factor, such as a particular type of drill material in arithmetic, for the duration of the experiment. At the end, the investigator applies a final test for the purpose of determining the gain in achievement that has resulted from the application of the experimental factor.¹¹

Necessary procedures in the schoolroom experiment are (a) "selection of two or more equivalent groups of subjects, (b) maintenance of a specified status of the experimental factor in the experimental group and in the control group throughout the duration of the experiment, (c) control of the various nonexperimental factors, (d) dependable measures of the dependent variable."¹¹

It is evident, from these analyses, that a successful experimental research employs the method of reflective thinking. Following a feeling that improvement is needed and possible in a specific situation, where many factors are operating, a difficulty analysis, more or less formal, isolates well-defined problems that need solution. These are attacked, one at a time, in terms of hypothetical conclusion, evidence on the

¹⁰ P. R. Rodosavljevich, "Introduction" in W. A. Lay, *Experimental Pedagogy with Particular Reference to Education through Activity*. New York: Prentice-Hall, 1936.

¹¹ W. S. Monroe and M. D. Engelhart, *Experimental Research in Education*. Urbana, Ill.: Bureau of Educational Research, University of Illinois, 1930, Bulletin No. 48, pp. 15-16; and *The Scientific Study of Educational Problems*. New York: The Macmillan Company, 1936, Chapter IX, "Studying the Effect of a Specific Change in a Given Cause," p. 277.

value of which is obtained by controlled experimentation of a definite type. This involves a measurement program that checks changes in the experimental variable over a period of development. Generalizations appear in terms of the problem dealt with and the experimental results obtained, and these are evaluated for predictive use in larger realms of time and space.

B. Types of Experiments

Experimental research may be considered as of two general types: (a) that which deals with individual situations and (b) that which uses groups of subjects. The former is usually laboratory experimentation, either *in situ*, in the natural location, or in an especially arranged situation. In the natural science field, experimentation in an especially arranged situation is most often the method of procedure. Illustrations of the laboratory experimentation of many workers, such as Louis Pasteur and Joseph Lister, have already been given. In addition to these biological students, there are, of course, the leaders in physics, astronomy, chemistry, and the other natural sciences.

Experiments in visual perception of the human eye illustrate one area of laboratory attack of great significance to education, as reading abilities are involved. At the opening of the century, E. B. Huey, of the University of Missouri, and Raymond Dodge,¹² then at Wesleyan University, made careful studies of eye perception. The former attempted to record movements by means of a small disc glued to the cornea. A thread attached to this made marks on a revolving drum. The latter used photography, reflecting a beam of light from the cornea to a moving sensitive plate. The oscillations of a spring pendulum were photographed along the edge of the moving plate, and a count of the jagged indentations gave a time measurement.

W. F. Dearborn, then of the University of Wisconsin, and C. H. Judd¹³ and his group at the University of Chicago continued these

¹² E. B. Huey, *The Psychology and Pedagogy of Reading: With a Review of the History of Reading and Writing and of Methods, Texts, and Hygiene in Reading*. New York: The Macmillan Company, 1908; Raymond Dodge, *An Experimental Study of Visual Fixation*. New York: Psychological Review Company, 1907.

¹³ W. F. Dearborn, *The Psychology of Reading: An Experimental Study of the Reading Pauses and Movements of the Eye*. Lancaster, Pa.: Science Press, 1906; C. T. Gray, *Types of Reading Ability as Exhibited Through Tests and Laboratory Experiments*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1917, No. 5; C. H. Judd, *et al.*, *Reading: Its Nature and Development*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1918, No. 4; C. H. Judd and G. T. Buswell, *Silent Reading: A Study of the Various Types*. Supplementary Educational

laboratory studies of the eye in reading. Both centers used the photographic method. The Chicago experiments have the advantage of a Commonwealth Fund subvention and an especially constructed machine. The procedure in the use of this apparatus is described briefly by G. T. Buswell.

It consists of photographing a beam of light, generated by the arc lamp, reflected first to the cornea of the eye from silvered glass mirrors, and then from the cornea through a camera lens to a moving film. The pencil of light changes its direction with each movement of the eye. The subject reads and a photograph is made on the film which records the movements of the eye as a sharply focused line. An electrically driven tuning-fork, with a vibration rate of fifty times per second, is mounted in the path of the beam of light in such a way that the light is intercepted at each vibration. These vibrations produce on the film a line of dots rather than a solid line, each dot representing a time of exactly one-fiftieth of a second. Since the film is moved continuously in the vertical plane, the record shows a vertical line of dots while the eye is fixated in a single position, and a short horizontal line when the eye is in motion in a horizontal or oblique direction. Vertical movements of the eye are lost. A second line, the headline, is obtained on the film by the reflection of the light from a bright nickel-plated bead fastened to the rim of a pair of spectacles worn by the reader. This line shows any head movement which may occur, and since it is impossible to eliminate all head movement, this line is of the greatest importance. Every eye-fixation is located with reference to the position of the headline, and by this means correction is made for all head movement.¹⁴

Psychology, a newer science, has progressed through laboratory experimentation in the realm of mind activity. Very probably, the most valuable achievements have been in analysis of learning and associated abilities. Outstanding studies have been those of Hermann Ebbinghaus in memory and forgetting, I. P. Pavlov on the conditioned reflex, E. L. Thorndike with the laws of learning and transfer, J. M. Cattell on reaction time, W. B. Cannon among emotional reactions,

Monographs. Chicago: University of Chicago Press, 1922, No. 23; G. T. Buswell, *Fundamental Reading Habits: A Study of Their Development*, Supplementary Educational Monographs. Chicago: University of Chicago Press, 1922, No. 21; *A Laboratory Study of the Reading of Modern Foreign Languages*. New York: The Macmillan Company, 1927; and *Remedial Reading at the College and Adult Levels*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1939, No. 50.

¹⁴ G. T. Buswell, *An Experimental Study of the Eye-Voice Span in Reading*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1920, No. 17, pp. 3, 4. Compare Evelyn Hallock, "Diagnostic and Remedial Work in a Reading Clinic," *Nation's Schools*, 28: 28-49, 1941.

Wolfgang Kohler in perception, E. H. Weber and G. T. Fechner in psychophysics, and K. S. Lashley in habit formation.¹⁵

In the realm of educational psychology, one finds the laboratory method also. Perhaps the necessity for costly apparatus and equipment, as well as the regrettable disregard of individual differences and almost universal group teaching in the public school, account for the fact that relatively few institutions for the education of teachers have used the laboratory method of experimentation, where subjects are studied individually. However, it cannot be denied that the psychological laboratory, of the type discussed by F. N. Freeman¹⁶ of the University of California, has its place. Careful analyses of the composites of personality are possible by this method. Logically, its activities are basic to education, as here the natural learning process of the child is studied. This gives the teacher a necessary body of information about how the immature human mind acts, reacts, and develops. This is the material of the teacher's art. A good body of preknowledge should replace more or less blind trial-and-error guidance of learning.

One outstanding illustration of valuable laboratory experiments in the field of educational psychology is found in measurements of reaction time. That there are individual differences with regard to this is generally known from the testimony of witnesses in automobile accident trials and from the records of drivers' license examinations. One finds accounts of tests in the time required to record the transits of stars among German scientists early in the 1800's, and about the middle of the century Hermann F. L. von Helmholtz,¹⁷ the world-famous physiologist, made his measurements of nerve conduction.

J. M. Cattell, formerly editor of *School and Society* and other

¹⁵ Hermann Ebbinghaus, *Memory: A Contribution to Experimental Psychology*. New York: Teachers College, Columbia University, 1913; I. P. Pavlov, *Conditioned Reflexes: An Investigation of the Physiological Activity of the Cerebral Cortex*. Oxford, Eng.: Oxford Press, 1927; E. L. Thorndike, et al., *The Fundamentals of Learning*. New York: Teachers College, Columbia University, 1932; J. M. Cattell, "On Relations of Time and Space in Vision," *Psychological Review*, 7: 325-342, 1900; W. B. Cannon, *Bodily Changes in Pain, Hunger, Fear, and Rage: An Account of Recent Researches into the Function of Emotional Excitement*. New York: D. Appleton-Century Company, 1929; Wolfgang Kohler, *The Mentality of Apes*. New York: Harcourt, Brace and Company, 1925; C. S. Myers, *Textbook of Experimental Psychology with Laboratory Exercises*. Cambridge, Mass.: Harvard University Press, 1911; K. S. Lashley, *Brain Mechanisms and Intelligence*. Chicago: University of Chicago Press, 1929.

¹⁶ F. N. Freeman, "The Place of Laboratory Experiment in Educational Research," *Review of Educational Research*, 4: 97-107, 1934.

¹⁷ H. F. L. von Helmholtz, *Archiv für Anatomie, Physiologie und Wissenschaftliche Medizin*, 24: 276-364, 1850.

journals, is very probably the psychologist who has made the greatest advance in this realm of problems. Coming in 1886 with a doctor's degree from the laboratory of Wilhelm Wundt at the University of Leipzig, he indicated the field of his scientific interest by the title of his dissertation, *The Time Taken Up by Cerebral Operations*.¹⁸ His American work and that of his associates was at Columbia University. This culminated, in 1893, in an extensive report on experiments in human nerve action measured in reaction time. Electrical stimuli were used, and units of time as brief as one thousandth of a second were measured by the chronoscope. Later experiments have concluded that the speed of man's nervous impulse is about 395 feet per second.¹⁹

It may be seen that the case study, when carefully conducted, may be considered to be laboratory experimentation. The reading study,²⁰ discussed in Chapter VII, is an example in the field of education. In the field of sociology, researches are usually made *in situ*. As an illustration, the analysis of the adjustment problems of a boy of Greek parentage from the age of sixteen to twenty by the Judge Baker Foundation (Chapter VII) may be cited.²¹

Definite data were obtained about his family and ancestry, physical development, habits and interests, school achievement, juvenile court record, mental test scores, and estimates of traits. As two checks were made, with an interval of about four years, it is thought that this case study may be classified as experimental. A discussion of this point by F. N. House of the University of Virginia is significant.

In the Judge Baker Foundation case studies, considerable emphasis is placed upon the *individualization* of cases. This principle would seem to involve the denial of all possibility of applying science in the diagnosis and treatment of such cases, for science is in essence *generalized* knowledge. What is really implied by the attempt to use such case studies for the training of case-workers is that the cases may be resolved by analysis into elements which can be seen as manifestations of universal, or at least widespread, forces and mechanisms. Knowledge of these forces and mechanisms, it is implicitly assumed, can be gained by the study of certain cases, and subse-

¹⁸ J. M. Gattell, *The Time Taken Up by Cerebral Operations*. Doctor's Dissertation, University of Leipzig. Leipzig, 1886.

¹⁹ C. J. Herrick, *An Introduction to Neurology*. Philadelphia: W. B. Saunders Company, 1931.

²⁰ Claire S. Leuenberger, *A Case Study in Diagnostic and Remedial Reading*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

²¹ W. A. Healy and Augusta F. Bronner, editors, *The Judge Baker Foundation Case Studies*. Boston: Judge Baker Guidance Center, Judge Baker Foundation, 1922, Series 1, Case Study No. 1.

quently used in dealing with other cases. It seems legitimate and proper in the present methodological study to describe the assumptions, the logical procedures, and the general conclusions which are implicitly present in the case study as published.

Hypotheses and assumptions.—It is difficult to discover any special hypotheses which this case study is designed to test. The editorial treatment has very much the character of open-minded exploration, recording whatever findings may appear, and indicating the applicability of whatever generalized knowledge may be available to the interpretation of the facts at hand. As suggested above, the implied scientific objectives may be said to be these: the identification and the characterization of the factors or forces affecting personal behavior in this type of case, and the description of the processes whereby these factors interact to bring about the behavior sequence. The language of the editorial comment on the factual data is such as to imply that this case is representative of many others. It may therefore be named as an *unconscious assumption*, or perhaps a conscious one, that the processes and forces involved in the determination of the behavior sequences in this case are in some degree the same as those involved in other cases.

One important general methodological hypothesis is visible in the treatment of this case; namely, that a concrete, long-period human-behavior sequence such as is here studied may best be made intelligible in terms of *subjective* factors and processes; that is, the wishes of the individual, his experiences as preserved in memory, and his definitions of the situations in which he finds himself. In other words, the method of this study is distinctly not "behavioristic" in the narrow and technical sense of the term. The physical traits and handicaps of the individual are regarded as indirect, rather than as direct, dynamic factors in his behavior. . . .

It may be said that two general types of methods were employed in this case study in reaching the general conclusions: (a) the interpretation and analysis of available factual data, and (b) a method which may be thought of as *sociological experiment*, beginning essentially after the boy was first seen by the Foundation, and involving the trying-out of certain treatment and subsequent observation and interpretation of the results of this treatment. Only to a very limited extent could the factors in this experiment be controlled; and, it may be added, the subjective processes assumed to be involved in the determination of the behavior could be observed to only a limited extent. The editors themselves emphasize strongly the limitations of the insights they were able to gain by the study of this case.²²

J. S. Mill, the logician of the scientific movement of the middle of the last century (which produced Charles Darwin, the evolutionist; T. H. Huxley, Darwin's "bull dog"; and Herbert Spencer, their philosopher and sociologist), has analyzed "the operation of the human understanding in the pursuit of truth." He deals with "The simplest

²² F. N. House, "Social Forces in Personal-Behavior Sequences Studied by the Judge Baker Foundation," Analysis 36 in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, pp. 503-505.

and most obvious modes of singling out from among the circumstances which precede or follow a phenomenon, those with which it is really connected by an invariable law." ²³ He concludes that one of these methods is to contrast instances in which the phenomenon occurs. He advances as a second method the comparison of instances in which the phenomenon does occur with instances, identical in other respects, in which it does not occur. He considers these to be the principal procedures of experimentation.

It seems to be apparent that the second of these methods, that of determining differences, is highly important in controlled experimentation. It assumes investigation of the operation of a single variable, well defined and perfectly controlled, in two or more identical situations or with equivalent groups of subjects.

J. S. Mill gives in all five modes of discovering and verifying laws of nature. These he calls canons, or rules. Each is preceded by an axiom, a self-evident truth.

FIRST CANON

Axiom—Whatever circumstance can be excluded, without prejudice to the phenomenon, or can be absent notwithstanding its presence, is not connected with it in the way of causation. The causal circumstances being thus eliminated, if only one remains, that one is the cause which we are in search of: if more than one, they either are, or contain among them, the cause: and so, *mutatis mutandis*, of the effect. As this method proceeds by comparing different instances to ascertain in what they agree, I have termed it the Method of Agreement: and we may adopt as its regulating principle the following canon.

Method of Agreement—If two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree is the cause (or effect) of the given phenomenon.

SECOND CANON

Axiom—Whatever antecedent cannot be excluded without preventing the phenomenon, is the cause, or a condition, of that phenomenon; whatever consequent can be excluded, with no other difference in the antecedents than the absence of a particular one, is the effect of that one. Instead of comparing different instances of a phenomenon, to discover in what they agree, this method compares an instance of its occurrence with an instance of its nonoccurrence, to discover in what they differ. The canon which is the regulating principle of the Method of Difference may be expressed as follows. *Method of Difference*—If an instance in which the phenomenon under inves-

²³ J. S. Mill, *A System of Logic: Ratiocinative and Inductive; Being a Connected View of the Principles of Evidence and the Methods of Scientific Investigation*. New York: Harper & Brothers, 1873, Chap. VIII, p. 222.

tigation occurs, and an instance in which it does not occur, have every circumstance save one in common, that one occurring only in the former; the circumstance in which alone the two instances differ, is the effect, or cause, or a necessary part of the cause, of the phenomenon.

THIRD CANON

Axiom—There are many cases in which, although our power of producing the phenomenon is complete, the Method of Difference either cannot be made available at all, or not without a previous employment of the Method of Agreement. This occurs when the agency by which we can produce the phenomenon is not that of one single antecedent, but a combination of antecedents, which we have no power of separating from each other and exhibiting apart. . . . This method may be called the Joint Method of Agreement and Difference.

The Joint Method of Agreement and Difference—If two or more instances in which the phenomenon occurs have only one circumstance in common, while two or more instances in which it does not occur have nothing in common save the absence of that circumstance; the circumstance in which alone the two sets of instances differ, is the effect, or cause, or a necessary part of the cause, of the phenomenon.

FOURTH CANON

Axiom—When all ascertained effects of known causes are subtracted from any situation, any effects remaining must be related to causes overlooked.

Method of Residues—Subduct from any phenomenon such part as is known by previous inductions to be the effect of certain antecedents, and the residue of the phenomenon is the effect of the remaining antecedent.

FIFTH CANON

Axiom—If a modification in the factors of one situation is accompanied by changes, item by item, in the variables in another situation, there may be present some causal relationship. (Of course, the relationship of cause and effect cannot be assumed. Nor can it be known which phenomenon is the cause, except by actually trying to produce the one situation by means of the other.)

Method of Concomitant Variations—Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner, is either a cause or an effect of that phenomenon, or is connected with it through some fact of causation.

It is seen that these five methods cover the entire realm of activities of human investigation, as far as the gathering of data is concerned. They include a wider field than the discussion of this chapter, which is confined to the procedures of the experimental method as defined in Section A. However, the student should note that they do not provide for all of the activities of a complete act of reflective thought. They do not go beyond induction. Corroboration and verification are

not provided for; nor is prediction. This is very near to unguided Baconian method. The student should study carefully Chapter VIII of Mill's statement, and in particular should analyze the illustrations as given in his Chapter IX. For purposes of a study of experimental research, the method of difference has to be most carefully understood.

J. S. Mill illustrates the experimental method of difference in terms of John Herschel's investigation of the theory of dew. He characterizes this example as the "use of the most beautiful specimens of inductive experimental inquiry lying within a moderate compass." The details of the reasoning process, as interpreted by Mill, culminate in the following conclusion:

The second corroboration of the theory is by direct experiment, according to the canon of the Method of Difference. We can, by cooling the surface of any body, find in all cases some temperature (more or less inferior to that of the surrounding air, according to its hygrometric condition) at which dew will begin to be deposited. Here, too, therefore, the causation is directly proved. We can, it is true, accomplish this only on a small scale; but we have ample reason to conclude that the same operation, if conducted in Nature's great laboratory, would equally produce the effect.

And, finally, even on that great scale we are able to verify the result. The case is one of those (rare cases, as we have shown them to be) in which Nature works the experiment for us in the same manner in which we ourselves perform it; introducing into the previous state of things a single and perfectly definite new circumstance, and manifesting the effect so rapidly that there is not time for any other material change in the pre-existing circumstances. Let us quote again Sir John Herschel:—(*Discourse on the Study of Natural Philosophy*) "It is observed that dew is never copiously deposited in situations much screened from the open sky, and not at all in a cloudy night; but if the clouds withdraw even for a few minutes, and leave a clear opening, a deposition of dew presently begins, and goes on increasing. . . . Dew formed in clear intervals will often even evaporate again when the sky becomes thickly overcast." The proof, therefore, is complete, that the presence or absence of an uninterrupted communication with the sky causes the deposition or nondeposition of dew. Now, since a clear sky is nothing but the absence of clouds, and it is a known property of clouds, as of all other bodies between which and any given object nothing intervenes but an elastic fluid, that they tend to raise or keep up the superficial temperature of the object by radiating heat to it, we see at once that the disappearance of clouds will cause the surface to cool; so that Nature, in this case, produces a change in the antecedent by definite and known means, and the consequent follows accordingly; a natural experiment which satisfied the requisitions of the Method of Difference.²⁴

²⁴ J. S. Mill, *A System of Logic: Ratiocinative and Inductive; Being a Connected View of the Principles of Evidence and the Methods of Scientific Investigation*. New York: Harper & Brothers, 1873, Chap. VIII, pp. 246-247.

When experiments involving the use of groups of subjects are considered, three types usually appear. The first of these uses (a) one experimental group; the second (b), two or more equivalent groups; and the third (c) rotates groups or experimental factors.

W. A. McCall of Teachers College, Columbia University, characterizes the first type of experiment as follows:

A *one-group experiment* has been conducted where one thing, individual, or group has had *applied to it* or *subtracted from it* some experimental factor or factors and the resulting change or changes have been estimated or measured.²⁵

An illustration of the one-group experiment is found in a study of class size in the primary school in southern Colorado.²⁶ In this research, twenty-two classes in grades one to four inclusive were used in Trinidad and two in grades three and four in Pueblo, District Number 20. Table XVI gives the experimental groups and IQ equivalence. Other criteria used for pairing groups were life age, sex, social and economic background, previous educational achievement, health status, potential mental age, and judgments of principals and teachers.

The control of other influences outside of size of class, so that they would remain the same for both semesters, was very difficult, but extremely essential to the success of the experiment. The teacher factor was held approximately constant by having the same instructor handle each experimental group both semesters. The twenty-four teachers undertook the year's experiment voluntarily and with a high degree of understanding of and interest in the project. Native intelligence was controlled by selecting pupils for class membership at the beginning of the school year and for transfer at the beginning of the second semester, so that the central tendencies and spread of IQ's in paired classes would remain very similar. It is seen in Table XVI that, in general, there was a discrepancy of only 2.3 points in median IQ's and 1.3 points in Q's; the one a measure of central tendency and the other of variability, or spread.

As many other factors as possible were held constant also. Life age, sex, and health were controlled from the records. Previous educational achievement was quite equivalent. This refers to general

²⁵ W. A. McCall, *How to Experiment in Education*. New York: The Macmillan Company, 1923, and *Measurement*. New York: The Macmillan Company, 1939.

²⁶ F. L. Whitney, *The Trinidad-Pueblo Experiment in Class Size in the Primary School*, Study No. 113. Greeley, Colo.: Department of Educational Research, Colorado State Teachers College, 1930; F. L. Whitney and G. S. Willey, "Advantages of Small Classes," *School Executives Magazine*, 51: 504-508, 1932.

TABLE XVI

PUPIL GROUPS USED IN THE TRINIDAD-PUEBLO STUDY IN CLASS SIZE,
FIRST AND SECOND SEMESTERS, 1929-1930

Class code number	School and teacher	Grade	Semester	Total number of pupils	Average size of classes ^a	Median IQ	Q of IQ
1	2	3	4	5	6	7	8
1	<i>Park Street, Trinidad</i> Miss Dollie Elliot . . .	1	Second	20	18.5	95.0	18.8
			First	48	43.8	94.3	22.8
2	Miss Mabel Bailey . . .	1	First	22	19.0	95.0	22.7
			Second	51	39.4	94.3	25.5
	<i>Sante Fe, Trinidad</i> Miss Edna Couey . . .	1	Second	21	18.9	88.0	17.5
			First	57	42.9	86.1	21.8
4	Miss Dorothy Albright	1	First	20	20.0	90.0	20.0
			Second	53	44.8	86.8	16.2
	<i>East Street, Trinidad</i> Mrs. Scott Fowler . . .	1	Second	21	20.0	98.0	20.8
			First	55	49.0	87.8	19.9
	<i>Rice, Trinidad</i> Miss Beatrice Biebush	1	First	20	19.2	103.0	16.3
6			Second	54	39.5	89.4	22.7
	<i>Park Street, Trinidad</i> Miss Frances Willis . .	2	Second	20	20.0	109.0	17.5
			First	46	41.4	109.4	17.0
8	Miss Eleanor Miller . . .	2	First	21	17.0	113.2	17.8
			Second	49	43.4	112.2	18.1
	<i>Sante Fe, Trinidad</i> Miss Minnie Adamson	2	Second	21	19.3	104.2	16.9
			First	52	43.5	106.0	21.7
10	Miss Mabel Moser . . .	2	First	21	20.0	101.3	27.3
			Second	47	39.8	105.8	24.8
	<i>East Street, Trinidad</i> Miss Lura Griffith . .	2	Second	20	19.3	93.3	20.0
			First	50	40.7	93.0	21.6
12	Miss Rose Huiatt . . .	2	First	20	20.0	93.3	22.5
			Second	44	40.5	93.3	23.5
	<i>Sante Fe, Trinidad</i> Miss Georgia Allen . .	3	Second	21	20.3	98.8	32.1
			First	55	44.4	98.1	32.3
14	Miss Eileen Southard .	3	First	21	17.5	101.3	33.4
			Second	58	43.6	101.7	32.2
	<i>East Street, Trinidad</i> Miss Dorothy Schuler .	3	Second	22	19.9	97.5	25.0
			First	51	43.6	95.5	23.2
16	Mrs. Nelle Kerr	3	First	21	19.1	93.8	37.0
			Second	53	41.0	90.8	33.0
	<i>Central Grade, Pueblo</i> Mrs. Cummings	3	First	20	20.0	120.7	15.5
			Second	40	36.6	112.5	22.4
18	Miss Irene Rayner . . .	4	First	22	20.9	105.0	14.8
			Second	43	41.5	99.4	24.5

TABLE XVI (Continued)

Class code number	School and teacher	Grade	Semester	Total number of pupils	Average size of classes ^a	Median IQ	Q of IQ
1	2	3	4	5	6	7	8
19	<i>Park Street, Trinidad</i> Miss Fern Zellers.....	4	Second First	21 54	20.0 45.4	105.0 102.7	22.9 17.8
20	Mrs. Elizabeth Meagher.....	4	First Second	20 55	20.0 48.2	102.5 102.8	19.2 18.6
21	<i>Sante Fe, Trinidad</i> Miss Alverna Robert- son.....	4	Second First	20 46	20.0 43.3	107.5 105.8	18.8 18.9
22	Miss Blanche Couey.	4	First Second	20 45	19.9 41.6	105.0 104.4	16.3 16.5
23	<i>East Street, Trinidad</i> Miss Clara Jones....	4	Second First	20 49	20.0 43.4	100.0 94.8	20.0 22.7
24	Mrs. Roy de Rouen... Miss Elinor Black ^b ...	4	First Second	21 50	19.0 42.3	100.6 98.8	22.5 22.0
Total.....				869			
Average of small classes.....				20.7	19.5	100.9	21.4
Average of large classes.....				50.2	42.6	98.6	22.7

^a The average size of class was obtained by dividing the total number of days belonging by the number of days the experiment was in progress.

^b Miss Black had charge of the group during the second semester.

levels of academic success attained during whatever previous school experience there had been. The intimate personal knowledge that principals and teachers had of each pupil was utilized also, and this was extended to social status, although no socio-economic scale was used for home background. Potential mental age was considered. This was computed by adding the expected increment of mental growth to obtained mental ages as determined in grade one. School environment in rooms, buildings, and playgrounds was constant for all groups throughout the experimental year. The curriculum was not varied nor changed, and was identical in all classes of the same grade.

The important factor of primacy of large or small group experience was considered. It is seen that any differences found between first and second semester school achievement are involved here. It is probably true that more rapid improvement is made in beginning the school subjects. Furthermore, the practice effect of experience with standard tests makes some differences in reaction to them during the

first and the second semesters of the experiment. Twelve of the groups were in small situations the first semester and twelve were in large rooms, whereas the opposite was true over the second half-year of teaching.²⁷

Thus, the experimental factor of class size was isolated in the complicated realm of activity in which it was operating and was examined naked, in a manner similar to that in which the biologist pins down to his dissecting table the specimen he is studying. The situation conformed to the last definition of experimentation in the previous section. It is "the name given to the type of educational research in which the investigator controls the educative factors to which a child or group of children is subjected during the period of inquiry and observes the resulting achievement."²⁸

The general plan of the project was to vary the factor of size of class and to keep constant, as far as possible, all other existent variables. This was effected by the shifting of pupils in each grade at the beginning of the school year so that enrollments of fewer than twenty and of more than forty would be found in all of the twenty-four rooms used in the experiment. A core of twenty pupils in each room constituted the experimental subjects, and at the beginning of the second semester of the school year pupils were transferred again so that the group of twenty that had been handled alone were placed in large classes of forty or more and the groups of twenty that had been seated in the large rooms were placed in rooms by themselves. Thus each experimental group of twenty pupils had one semester's experience alone and another semester's work as part of a large class of forty or more pupils.

It has been said that pupil groups were rotated or shifted through two types of situations, small-class and large-class rooms. In this respect, the experiment may be classified as McCall's third type, the rotation method of controlled experimentation. Often experimental procedures in a specific project include characteristics of more than one type of setup. This will be recognized as the student analyzes and evaluates illustrative examples of this method of research.

The results of the experiment were reported in terms of differences in gains or losses in educational achievement found for the central core of twenty pupils over the semester of time when they constituted an isolated, small class and the semester when they were working as a part of a large group or forty or more.

²⁷ F. L. Whitney and C. G. Swanson, "A Comparison of the First and the Second Semester Progress of Primary Pupils," *School and Society*, 34: 377-379, 1931.

²⁸ W. S. Monroe and M. D. Engelhart, *Experimental Research in Education*. Urbana, Ill.: Bureau of Educational Research, University of Illinois, 1930.

This computation may be put into rough equation form:

CS (change in achievement in small rooms) = Initial Test — Final Test.

CL (change in achievement in large rooms) = Initial Test — Final Test.

D (achievement difference in small and in large classes) = CS — CL.

Obviously, if this final difference (D) is positive, the result of the experiment will be in favor of a smaller teacher-classroom load. If it is negative, larger classes might be recommended. The results of this means of determining differences are given in the second paragraph below. It will be noted that they are based, not simply on the averages of group achievements, but are derived from distributions of the actual gains of each individual pupil.

When a check was made of differences in school achievement in small and in large classes in terms of gains computed from scores on standard tests, the results were on the whole rather indeterminate, as in previous studies in this field. Group differences calculated from central tendencies were found to be about the same as those reported by Stevenson²⁹ in 1922, but it is not thought that either of these computations can be defended statistically. Perhaps the facts on percentage of gain are more reliable. These data show that in the Colorado study there was a difference of about 6 per cent in favor of small classes in grades 1, 2, 3, 4; but in the Ohio study, a gain of 9 per cent was found favoring large groups in grades 2, 5, 7.

A more dependable method of determining achievement in small and in large classes was used in the Colorado experiment, by which the difference in gains of each individual pupil was determined in the two types of classroom situations. Distributions of these differences, both positive and negative, for the 400 pupils present over both semesters of the school year, showed, on the whole, greater gains in small classes. However, when they were seated with the larger groups the first semester, a slight difference favoring the large class appeared; but when this factor of primacy of large or small class experience was held constant, the total mean gain made by individual pupils favored the small class situation. This average gain was very small, about one-fifth of a sigma, only four hundredths of any difference possible. Further, a determination of the reliability of this difference,³⁰ a matter which has been neglected in previous studies in this field, shows it to be only a little above pure chance, some over 60 in 100.

An examination of these average grade-subject differences gives some information on optimum group sizes in the nine situations studied. Eight of them, all but fourth-grade science, favored the small class; and of these, the third-grade arithmetic showed the greatest gains, while the fourth-grade English and arithmetic showed the smallest gain.

Differences discovered were very small in general. But it may be that such gains as more than one-third of a sigma in small third-grade classes, over one-

²⁹ P. R. Stevenson, *Relation of Size of Class to School Efficiency*. Educational Research Bulletin. Urbana, Ill.: University of Illinois, 1922, No. 10.

³⁰ J. D. Heilman, "The Misuse of Statistical Methods," *The Teachers Journal and Abstract*, 5: 440-441, 1930.

fourth sigma in the subject of arithmetic, or nearly two-thirds sigma in third-grade arithmetic are significant as representing a group of facts which should be definitely determined for application to small and large group work in the primary school. Perhaps in the skill subjects, small classes are more desirable, and very large situations may be justifiable when information or the development of attitudes and appreciations are the criteria.⁸¹

Although in many respects this Colorado experiment was good in that it conformed rather well to accepted criteria for this method of research, the following constructive criticism should be carefully read by the student who is expecting to use the experimental method in a solution of his problems.

The tools for measurement, which must be used in any investigation in the field of the social sciences, are rough and clumsy; and expressions of amount decided on to date are uncertain and wavering in meaning. For this reason, any attempt to set up a perfect educational experiment must fail in part; and that reported above is no exception.

However, it is thought that some improvement has been made on previous studies of class size in the primary school. The experimental factor of class size was carefully defined and rigidly maintained with a standard of significant difference (20 or fewer and 40 or more) throughout the school year. Any knowledge of and experience with tried techniques which could be discovered was taken advantage of through close supervision. The teachers handling the 24 classrooms were a superior group, and their participation was entirely voluntary. An unusually high professional attitude maintained among cooperating agencies, the school board, the parents, the superintendent, and the principals. The problem of difficulty in obeying the law of the single variable was attacked consciously and solved with a high degree of success. It might have been better to equate pupil groups in terms of mental age instead of IQ, but this was not feasible as it would have involved the transmutation of the records of each individual pupil; and lack of time prevented this. The reliability of differences in school achievement found was computed, a necessary task which has been neglected heretofore.

The most serious criticism which must be made of this experiment in class size in the primary school is that the criterion used for school efficiency, while traditional and in itself good, is not an adequate and inclusive measure of important outcomes which should be sought in elementary education. There is a group of very intangible but crucial educational results which every primary school curriculum should provide for, but which are not considered in a standard testing program, such as was carried out in Trinidad and Pueblo in 1929-1930. Information and skills on the level of minimal essentials for membership in a democracy are only objective instruments, the actual use of which in social living will be determined by more subtle controls of conduct included in certain attitudes and appreciations, and in abilities in the higher realms of generalization, for example the application of principles, the testing

⁸¹ F. L. Whitney and G. S. Willey, "Advantages of Small Classes," *School Executives Magazine*, 51: 505, 1932.

of hypotheses and theories, the getting of inferences from specifics, and the like. The operation of these conventional counters will always depend upon that substratum of personality traits known as character. Any check of educational achievement, then, to be complete, should take account of items of personal and social development. An integrated personality, living consistently, is the ultimate objective to be recognized.

Future experiments in this field of endeavor should add to their traditional testing program to provide for these more important rubrics in a total list. This necessity is perhaps most pressing in the primary school where the group of school habits included in the curriculum is narrow, consisting most often of the simpler skills in silent reading and the rudiments of number relationship.

It is probable that it will not be necessary to set up another experiment with distinctively large and small class groups in the primary school, exactly like the procedures and techniques of the study described in this report. If the problem of class size is worth investigation on any level of advancement, this primary school experiment ought to be repeated with a more extensive sampling of pupil groups, and with a broadening of the achievement testing program to include important outcomes in addition to those usually measured in the traditional school tests. A project of this type is now in progress in the Ohio State University under the direction of T. C. Holy and R. W. Tyler.⁸² It shows that the average attainment of the large college zoology class is approximately as great in informational content, but small classes are superior in such aspects of achievement as those just mentioned as of greater importance. It was the original plan in the Trinidad-Pueblo experiment to construct an omnibus test to be used in addition to the standard tests and to include items dealing with social conduct, cooperation, the development of character traits, and the like; but it was not possible in the light of all the other conditions of the investigation. This is a task that the next student in this field should undertake.⁸³

W. A. McCall gives the following criteria for the selection and use of the one-group method:

1. Where the experimental factor or factors produce a relatively drastic effect, for this tends to make the influence of irrelevant factors practically negligible.
2. Where the experiment is of brief duration, for this abbreviates the action of large, constant, cumulative, irrelevant factors such as maturing for example.
3. Where the trait in question does not involve purposes or methods of work, for these usually show a larger carry-over than specific information.

⁸² R. W. Tyler, *et al.*, *Service Studies in Higher Education*. Athens, Ohio: Ohio University Press, 1932; C. H. Judd, *et al.*, "Results of Tests of Scientific Thinking," *Education as Cultivation of the Higher Mental Processes*. New York: The Macmillan Company, 1936, pp. 135-137.

⁸³ F. L. Whitney and G. S. Willey, *op. cit.*, p. 506; Earl Hudelson, *Class Size at the College Level*. Minneapolis: University of Minnesota Press, 1928.

4. Where the tests are scaled on the basis of the same unit for this increased probability of equality of units.⁸⁴

The *equivalent-groups method* of experimentation is used when the purpose of the experiment is to determine the superiority of one experimental factor over another and when the operation of these variables is observed in identical situations or in equivalent groups of subjects. It will be noted that Monroe and Engelhart in their 1936 statement assume the necessity of the controlled equivalent-groups procedure in creditable educational experimental research.⁸⁵

One illustration of a simple equivalent-groups procedure, which had a specific, creditable purpose, but which suffered from many disabilities of situation, time limits, and so on, is found in the work of a young student teacher in charge of a group of pupils in a junior high school laboratory school.⁸⁶

He wished to investigate the relative value (a) of textbook study in the classroom, and (b) of field trips, in a course in general science. The problem was, "What is the difference in achievement in junior high school work in general science, when two equivalent pupil groups are used, one taught by the traditional textbook classroom method and the other largely by means of field trips?"

He knew that his chief difficulty was to be found in the control of all of the factors and conditions involved so as to isolate those that he wished to study, namely, two types of teaching procedure in elementary science. He must obey the law of the single variable. He realized that here were a thousand and one other factors operating outside of these two—native intelligence of the children, their life age, home background, achievement in other school studies, number in the group, sex, and so on, as well as all teacher qualifications and characteristics. He held all teacher variables and one pupil factor constant by dividing the class into two equal groups and teaching both himself. Then he shifted pupils so that the average and the spread (quartile deviation) of the groups were very similar in IQ, achievement in an initial standard science test and a first new-form content test, school marks in all other subjects, life, age, and sex.

The course given was the same for both groups of pupils. They studied, in classroom and in field, such problems as how plants store food, humidity of the atmosphere, co-operation of the air, erosion, the

⁸⁴ W. A. McCall, *How to Experiment in Education*. New York: The Macmillan Company, 1923, pp. 28, 29.

⁸⁵ W. S. Monroe and M. D. Engelhart, *The Scientific Study of Educational Problems*. Urbana, Ill.: Bureau of Educational Research, University of Illinois, 1930.

⁸⁶ W. S. Curd, *The Value of Field Trips in the Teaching of Secondary School Subjects*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925.

working of common machines, city water supply and sanitation, and the like. The group working outside of the classroom made field trips to a sugar factory, a canning factory, a creamery, a bakery, a candy factory, a gas plant, an ice plant, a dairy, a cheese factory, a greenhouse, a garage, a city hall, a courthouse, and other situations illustrative of the problems they were studying. No specific items of reading were required of this group, but interesting titles were suggested.

At the close of the experiment, second forms of the standard and the new-type tests were administered. The results were classified by pairing pupils in the two groups in terms of five of the criteria used in the initial grouping: IQ, achievement in two types of examinations, school marks, and life age.

The computation for the results of the equivalent-groups experiment may be roughly expressed in these formulae:

CC (change in achievement in classroom group) = Initial Test — Final Test

CF (change in achievement in field group) = Initial Test — Final Test

D (achievement difference in classroom and in field group) = CC — CF.

If this difference (D) is positive, the result of the experiment will be in favor of the traditional classroom method. If it is negative, the field-trip method might be recommended.

This is a case of equivalent-groups experimentation. The effect of two experimental factors was sought. These variables were isolated, and their action observed and evaluated. It was not a perfect experiment. It is very difficult to control all conditions and variables outside of the laboratory in a complex human environment, such as one always encounters in the social studies.⁸⁷ But it was true experimentation in purpose and in point of view. Its repetition under better and better control ought to result in conclusions on higher and higher levels of generalization in the thinking process.

H. R. Douglas, now at the University of Colorado, reports an equivalent-groups experiment conducted in the laboratory junior-senior high school at the University of Oregon. The experimental factors were two sequences in supervised study. In *R-S*, the study followed the recitation during the long supervised study period. In *S-R*, the classes studied first, and then recited. Ten pairs of sections were used in history, civics, English, mathematics, and science. Each pair was controlled for equivalence on the basis of life age, initial test scores, and achievement scores. The method of combination was: "the scores on one of the two tests were multiplied by the ratio of the standard deviation of the scores made on the other test by the pupils of the class

⁸⁷ W. A. Brownell, "Some Neglected Safeguards in Control-Group Experimentation," *Journal of Educational Research*, 27: 98-107, 1933; S. A. Courtis, "Criteria for Determining Equality of Groups," *School and Society*, 35: 874-878, 1932.

to be paired to the standard deviation of the scores made on the test the scores of which were being converted.”⁸⁸ Teacher, time, situation, curriculum, attendance, and other variables were carefully controlled, as in the Trinidad-Pueblo experiment already discussed.

The results of the experiment were measured according to the formulae that have been given. No conclusive final generalizations appeared. Neither the *R-S* nor the *S-R* sequence was found to be better for all classes. However, a tentative conclusion was announced to the effect that the *S-R* order might be superior in the social studies and English, while the other plan might work better in mathematics and science.

McCall gives the following criteria for the selection of the equivalent-groups method of experimentation:

Where the amount of change in a situation or group under one experimental factor is practically identical with the amount of change under any other experimental factor, except for the difference in effectiveness of the contrasted experimental factors.

Where it is really possible to equate groups.⁸⁹

In the *rotation* method of experimentation, either groups or experimental factors or both are changed, or rotated. This actually involves the two preceding methods. It combines two or more one-group methods, except when the groups used are identical. Then, it is a combination of the one-group and the equivalent-groups methods. This procedure is very useful when small groups are used and there is serious difficulty in providing actual equivalence. When experimental factors are allowed to operate in reverse order, any carry-over effect present may be eliminated. It tends to iron out extraneous variables also, which it has not been possible to handle effectively in arranging groups.

E. H. Reeder of Teachers College, Columbia University, used this type of experimentation in investigating the relative value of two methods of studying geography. In his experiment on textbook study conducted at the Speyer School, New York, the two experimental factors are described as follows:

The text used in this experiment was *Human Geography*, by J. Russell Smith. The books were distributed at the beginning and collected at the end

⁸⁸ H. R. Douglas, *The Experimental Comparison of the Relative Effectiveness of Two Sequences in Supervised Study*. Eugene, Oreg.: University of Oregon Publications, 1927, Vol. 1, No. 4; “An Experimental Investigation of the Relative Effectiveness of Two Plans of Supervised Study,” *Journal of Educational Research*, 18: 239-245, 1928.

⁸⁹ W. A. McCall, *How to Experiment in Education*. New York: The Macmillan Company, 1923, p. 30.

of each study period in order that there might be no intervening reading of the text to disturb the controlled conditions. To the experimental group, study sheets containing page assignments as well as study questions were distributed with the books, and the pupils were told to follow the written directions. Copies of all the study sheets are included in the Appendix. With the control group, the books were distributed and the pupils were told to study as well as they knew how the same sections in the book as were covered by the study sheets furnished to the other class.⁴⁰

The experiment covered a time period of six weeks, divided into three two-week periods. Two seventh-grade classes of about two dozen pupils each were used. Both experimental factors and pupil groups were rotated each week.

Thus, if Class A constituted the experimental group the first week and Class B the control, Class B was the experimental group the second week and Class A the control. In this way each class was the experimental group three weeks of the six and the control group for the other three. Thus the six-week period divides itself naturally into three two-week units, in each of which each class was used both as an experimental group and as a control group.⁴¹

The experimenter was very naïve about both equivalence of groups and initial testing. He took the classes just as they were seated in the Speyer School, where homogeneous grouping was based on group intelligence tests. He attempted no pairing of pupils, nor did he test the groups for similarity of central tendency and type of distribution. He gave no tests at the beginning of the experiment, thus assuming the zero point in respect to knowledge of the content of the textbook used. In his report, he attempts to justify these serious errors in procedure and techniques.

The results of the experiment were computed in accordance with the following formulae:

CAS (change when group A used the study-question method) = FT⁴²

CBS (change when group B used the study-question method) = FT

TCS (total change for study-question method) = CAS + CBS

CAT (change when group A used the traditional method) = FT

CBT (change when group B used the traditional method) = FT

TCT (total change for traditional method) = CAT + CBT

D = TCS — TCT

Obviously, if the difference (D) is positive, the result will be in

⁴⁰ E. H. Reeder, *A Method of Directing Children's Study of Geography*, Contributions to Education. New York: Teachers College, Columbia University, 1925, No. 193, Chap. IV, "Experiments in Speyer School," p. 33.

⁴¹ E. H. Reeder, *op. cit.*, pp. 32, 33.

⁴² In these equations, FT should, of course, be IT — FT.

favor of the study-question method of procedure. If it is negative, the usual traditional method of studying will appear to be the better.

The Speyer School rotation experiment was favorable to the study-question method, as defined here. The total mean scores of the two groups, when they used this method, was 23.99. In the case of the traditional control method, it was 17.13. This made D equal 6.86. This obtained difference was examined for statistical significance, and it was found to represent a true mathematical superiority for the study-question method.

McCall gives the following criteria for the selection of the rotation method of experiment:

Where the amount of change in a situation or group under one experimental factor is practically identical with the amount of change under any other experimental factor, except for the difference in effectiveness of the contrasted experimental factors.

Where there is no carry-over from one experimental factor to another, or where, in case it occurs, the carry-over is natural.⁴³

C. Evaluation of the Experiment

Every inquiry with regard to the value of research methods made in preceding chapters has been in terms of the basic question, "How closely is this related to reflective thinking, and where does it find itself in the six steps of the reasoning process?" The two specific methods of investigation discussed in Chapters VII and VIII have been found to be creditable research, as far as they meet the criterion of actual reflection. Descriptive research is simply unthinking survey, unless it goes beyond the level of the collection of data. Its every procedure should be guided by a specific objective, and all material gathered should be useful as evidence on the actual generality of hypotheses set up about the solution of a problem under attack. In historical investigation, also, all activities should be in terms of contributions to problems of human relationship. The true meanings of events, episodes, and trends emerge from adequate interpretation of hypotheses, the value of which is determined by the evidence of the facts uncovered through the procedures of higher criticism.

In the same manner, the experimental method of inquiry should be evaluated basically in terms of (a) any elements of reflective thinking that may be present and (b) where it is found in the complete process of reasoning. The answer to this implied question appears in the analysis of any experimental setup that has been reported. For

⁴³ W. A. McCall, *How to Experiment in Education*. New York: The Macmillan Company, 1923, p. 31.

example, in the class-size investigation discussed in the previous section,⁴⁴ one finds that the thinking procedure follows the Dewey-Kelley steps rather closely.

REFLECTIVE THINKING IN EXPERIMENTATION

Thinking' Proccdures	Trinidad-Pueblo Proccdures
1. A felt difficulty	1. The executive board of the Department of Classroom Teachers, National Education Association, voiced a general feeling of dissatisfaction with teaching load among classroom teachers throughout the country. There was "lack of adaptation of means to end." ^a
2. Definition of the problem	2. They stated the problem involved as follows: What is the relation of class size in the primary school to school efficiency? Stanford University and Colorado State College of Education were asked to study and report on the problem. The first report was made by the latter center in terms of a statistical study of relationships, using the techniques of partial correlation. ^b
3. Adoption of tentative hypotheses	3. These were such as: (a) There may be a positive relationship between size of primary class and pupil achievement. This was suggested by the correlation study. (b) Adequate differences in class size are represented by twenty or fewer and forty or more pupils. (c) The one-group experiment is the best feasible setup for this investigation. (d) Primary school achievement is adequately measured by means of standard commercially purchased tests in numbers and reading. It was known that this assumption was false, but the hazards of research did not permit an adequate measurement program.

⁴⁴F. L. Whitney and G. S. Willey, "Advantages of Small Classes," *School Executives Magazine*, 51: 504-508, 1932.

REFLECTIVE THINKING IN EXPERIMENTATION (*Cont.*)

Thinking Procedures	Trinidad-Pueblo Procedures
4. Collection of evidence	4. This was by means of the twenty-four one-group experimental situations organized and carried through.
5. Corroboration of the conclusion.	5. It has not been determined to what extent the report of the experiment affected the facts of class size and teacher load in Colorado or among the members of the Department of Classroom Teachers, National Education Association.
6. Appraisal of the tentative generalization appearing	6. Follow-up experiments should have been set up and results reported, not only in the primary school but in many other educational situations.

^a John Dewey, *How We Think*. Boston: D. C. Heath and Company, 1933.

^b F. L. Whitney, "The Relation of Class Size to School Efficiency in the Primary School," Chapter III, p. 163, in *The Child and His Teacher*: Second Yearbook of the Department of Classroom Teachers, National Education Association, Washington, D. C., 1927.

Specific criteria for experimental research are obviously to be found among the activities of reputable scientists, in both the natural and the social realms, when they are engaged in controlled studies of the operation of variables in any situation.

Because the method of experimental research is the most useful and important way to obtain good evidence on the value of hypothetical solutions of natural and human problems, all of the thinking activities of all reputable scientists in any realm of inquiry will be pertinent in a search for criteria for this method of investigation. Just how did Louis Pasteur proceed in his refutation of the age-old theory of spontaneous generation? What were the parallel, but independent, methods of I. P. Semmelweis and later Joseph Lister, when applying these findings to the problems of antiseptic surgery? How did T. B. Macaulay gather the data for his historical inquiries? What is the method of Harold Nicolson in writing biographies, and of J. T. Adams in historical composition? Minute analyses of attitudes and the activities in the case of these and other outstanding research men will give valuable information about how to conceive, set up, and carry through a creditable piece of experimental research (see Exercise 1, Section E).

It is believed that there are at least seven basic considerations that should be kept carefully in mind when one is engaged in a study of problems on the level of creditable experimentation.

First of all, as in the attack on any question by any good method, (1) the *problem* should be carefully *isolated* from the confusion of the vague feeling of deficiency that precedes ordered reflection. The problem should, of course, be highly *important*, *capable of solution*, and *feasible*. Chapter III discussed these criteria in detail. That chapter should be carefully reviewed at this point. There is the question as to whether a good problem should deal with so-called pure research or should be practical in its objective. The conclusion in Chapter I is that this is not a very important point, because the findings of pure research are often found eventually to be applicable to the solution of the practical difficulties of everyday life in the home, industry, commerce, and the professions. However, it would seem that the greater part of the experimental research carried on in any realm of human activity should be on some level of practicality and should look consciously toward the solution of some of the sore difficulties present in modern society.⁴⁵ Decisions have to be made constantly on matters of basic importance. The more often they are derived from adequately generalized data, the better they will be.

At the beginning of the project, it is extremely essential that the nature of the variables dealt with be known in detail. (2) The *experimental factor* or factors should be carefully *defined*. If these do not stand out in clear-cut form among all influences operating in the field of research, there is danger that all experimental efforts may be wasted, and that no usable results will be forthcoming. For example, in the Trinidad-Pueblo experiment (Section B), the item of size of class was very definitely decided on at the beginning of the experiment as fewer than twenty and more than forty; and this criterion was attained and maintained as the study was carried through the experience of the entire school year.

A third consideration in this method of research is (3) the selection of the best *technique* for the *experimental setup*, whether one-group, equivalent-groups, or a combined rotation of procedures or situations. Obviously, it cannot be assumed that any type of experimental plan will be all right as long as minute care is used in planning. It is true that at times one may be nearly as good as another, but outside of considerations of intrinsic worth from a research viewpoint there are always minor but very determinative items in the situation that argue for one type of experimentation above all others. For example, in

⁴⁵ R. S. Lynd, *Knowledge for What?* Princeton, N. J.: Princeton University Press, 1939.

the simple tryout of textbook versus field-trip teaching,⁴⁶ it would perhaps have been better to apply the experimental factors to the same group of subjects over the time periods of successive quarters of the school year. This would have been the rotation method. But the necessary time limitations on the availability of the junior high school class used, as well as the fact that the experimenter was hurried in his report, which constituted his master's thesis, made it imperative that the plan used be adopted, and the project completed in one quarter's time.

Involved in this criterion is the problem of getting identity of experimental and control groups, when the equivalent-groups method of experimentation is decided upon. It will not do simply to choose groups by random sampling,⁴⁷ depending upon their size to cover up inequalities present. Nor will the comparison of groups, on the basis of similar point and spread measures of their distributions alone, be successful in getting actual equivalence. Further, there are dangers in the technique of pairing. In particular, there are difficulties in deciding just what and how many characteristics should be used. Monroe and Engelhart give this caution:

It is relatively easy to assemble two groups that are equivalent with reference to a given characteristic, provided that characteristic can be measured accurately. For example, pupils may be paired on the basis of mental age, or intelligence-test score, so that for each pupil in one group there will be a mate in the second group having the same mental age or test score. Obviously, it would be difficult, if not impossible, under typical conditions to assemble two groups by locating pairs of pupils that are equivalent in respect to all significant characteristics. Hence, in assembling equivalent groups by pairing, the experimenter usually considers only one or at most two characteristics. When the groups have been assembled, they should be checked for equivalence with respect to the remaining significant characteristics. For example, if two groups have been assembled by pairing pupils having the same mental ages, or intelligence-tests scores, the mean and standard deviation of each group should be calculated for chronological age, and previous achievement, when it is significant. If the mean and standard deviation of one group are not approximately equal to those of the other group, adjustments should be made to secure approximate equality of the pair of groups rejected for experimentation. If adequate measuring instruments were available, it would be desirable also to check the equivalence of the groups with respect to study habits and personality traits in the same way. The equivalence of the groups with respect to sex and race should be checked to make certain the groups exhibit no marked differences with respect to these charac-

⁴⁶ W. S. Curd, *The Value of Field Trips in the Teaching of Secondary School Subjects*. Greeley, Colo.: Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925.

⁴⁷ Helen M. Walker, "The Sampling Problem in Educational Research," *Teachers College Record*, 30: 760-774, 1929.

teristics. The experimenter should also make certain that the two groups involve no serious differences in physical condition.⁴⁸

Of supreme importance in experimental research is (4) adequate *control of all factors*, of all variables operating outside of the experimental factor itself. It is probably true that the most frequent sin against good research methods, on the part of many investigators, is the failure to obey the law of the single variable.⁴⁹ Unless extreme care is taken, in setting up the experiment, to define carefully and express in terms of amount every factor possible of measurement in the situation of research, any results finally forthcoming are certain to be of limited application and lesser value. It is true that, in the realm of the social sciences, the basic data that must be used are always comparatively rough and undefined. Because of this fact, it is very often highly desirable to use finally the technique of partial and multiple correlation, which makes it possible to hold constant as many independent variables as have been measured, while the relationship of any or all of them to the dependent factor is examined.⁵⁰

Another criterion is (5) the *selection* or making and the efficient *administration* of valid, objective, and reliable *tests* in a carefully planned measurement program. Many otherwise well-organized experiments may be of lesser value, because of ignorant selection of instruments for the report of changes produced and careless arrangement and administration of the testing programs engaged in. The time has passed when it may be assumed that any published test is adequate for use in any desired study. There are great differences among them. Before a final choice is made, each should be carefully examined for facts of validity and reliability, as well as for feasibility of administration, including time used, cost, and so on. The details of the testing program for the Trinidad-Pueblo class-size experiment resulted from an extensive consideration of all tools for measurement on the market, and the experimental periods were carefully determined on the basis of equal number of days of experience for both semesters of the year. It is true that the list of tests as actually administered was inadequate, as they did not measure those more subtle values, most important of all, which the primary children received from school experience. However, the original plan was to include these character traits and other items in an omnibus test, as explained. The fact that

⁴⁸ W. S. Monroe and M. D. Engelhart, *Experimental Research in Education*. Urbana, Ill.: Bureau of Educational Research, University of Illinois, 1930.

⁴⁹ Mary A. Burgess, *The Measurement of Silent Reading*. New York: Russell Sage Foundation, 1921.

⁵⁰ F. P. Frutchey, *Some Factors in Determining High-School Success*. Greeley, Colo.: Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930.

this was finally impossible is an illustration of the serious hazards of research in the field of the social sciences.

Perhaps the most serious problem connected with the measurement program in controlled experimentation has to do with the examination of reliability and the selection of reasonable interpretations of significant differences. One cannot assume that obtained differences, no matter how large numerically, are real expressions of actual contrast between situations examined experimentally. All of the facts about the distribution of factors involved should be examined statistically and compared with criteria for significance.⁵¹

The experimenter is obligated to make a detailed, understandable, readable (6) *report of all things done* from beginning to end during the carrying through of his project. American educators take the attitude that no experimental results are to be copyrighted or patented. They are for the benefit of the profession of education as a whole. But unless the report gives a complete account of all research activities carried through, so that all engaged in educational efforts may understand and benefit, this criterion is defeated, and the experiment becomes of lesser value to society. Furthermore, the written report should be in such terms that a check on procedures, techniques, and results obtained may be made or that the experiment may be repeated by any interested beginner in educational research. There is not enough repetition of research projects in the field of education, and this lessens the value of any generalizations reached.⁵² The form and logical arrangement of the final report is of basic importance, as well as its intrinsic content value. It should be readable and interesting, as well as accurate, informative, and contributory to the solution of problems in the field of inquiry dealt with (Chapter XVI).

Finally, provision should appear in the research report, as already intimated, for (7) a possible *repetition* of the *experiment* in another situation, with other groups of subjects, on a higher level of skill in the selection of methods and techniques used. There should be concrete provision for *further research* in the same or related fields also, since no research project says the final word in any situation. Ultimate truth is elusive. It is always flitting ahead just beyond the point

⁵¹ J. D. Heilman, "The Misuse of Statistical Methods," *The Teachers Journal and Abstract*, 5: 440-441, 1930; W. S. Monroe and M. D. Engelhart, *Experimental Research in Education*. Urbana, Ill.: Bureau of Educational Research, University of Illinois, 1930, Chapter III; F. L. Whitney, "Unitary Board Control for State Higher Education," *School and Society*, 42: 335-338, 1935.

⁵² F. L. Whitney, "The Need for the Repetition of Educational Experiments," Editorial, *Teachers Journal and Abstract*, 5: 182-183, 1930; W. A. McCall and G. J. Ruger, "Reliability of a Ph.D. Dissertation in Educational Psychology," *School and Society*, 7: 441-448, 1918.

attacked by present generalization. In order to make an attainment of these criteria possible, the report should be a detailed account of every activity of the period of experiment that has been experienced. Each detail is necessary in order that minute vicarious participation may give the succeeding worker a direction and impetus that will carry him into the next process of reflective thinking. Furthermore, definite suggestions should be made of next things to be done by way of experimentation. These will be projects that have occurred to the researcher while he has been at work, but which he could not engage in himself. Finally, a wonderful gift is furnished the person engaging in further research, if the annotated bibliography at the close of the report contains just those items that are pertinent to the objective of the experiment engaged in. And most valuable of all will be the critical analysis and criticism of this bibliography in the first chapter, which pictures adequately the background of research for the study made up to the time of its reporting.

TABLE XVII
A SCORE CARD FOR EXPERIMENTAL RESEARCH

Criteria	Scales		
	Low	Medium	High
1	2	3	4
1. The isolation of an important problem that can be solved and is feasible	3.9	5.2	7.8
2. The careful definition of experimental factors	3.2	4.9	6.6
3. The selection of the best type of setup (actual identity of situations in the equivalent-groups method)	2.8	4.1	5.5
4. Adequate control of all operating variables other than the experimental factor (law of the single variable)	2.6	3.9	5.3
5. The administration of an adequate measurement program (tests valid and reliable)...	2.0	3.0	4.3
6. The adequate reporting of the experiment (interpretation of significant differences)...	1.5	2.5	3.5
7. Provision for the possibility of repetition of the study and further research in the same field	1.0	1.6	2.2
Perfect score (total)	35.2		

A listing of these suggested criteria is given as Table XVII. These have been chosen and scaled by groups of beginning graduate students

engaged in research leading toward a higher degree. Perhaps they should be again revised as suggested in Chapter VII. Table XVIII

TABLE XVIII
STUDENT RATING OF AN EXPERIMENTAL RESEARCH REPORT ^a

Criteria and Criticism		Scores
I		2
1. <i>The isolation of a problem that can be solved and is feasible</i> —This problem is important, as it makes a great difference in the amount of money spent for teaching staff and equipment. The problem was fairly successfully separated from other factors in process of solving		6.4
2. <i>The careful definition of the experimental factor</i> —This problem was quite accurately defined		6.0
3. <i>The selection of the best type of setup</i> —Theoretically, the method of procedure was good, in that two balanced high school classes were used in the experiment the first year and a check study using the same methods was made the following year. The difficulty was at the start in accurately pairing pupils according to native intelligence		4.0
4. <i>Adequate control of all operating variables other than the experimental factor</i> —An attempt to control other factors was made, but it was not very successful. Also, no provision was made for pupils who dropped out; and by the time the experiment was completed it left only a small number from which to make generalized statements		2.9
5. <i>The administration of an adequate measurement program</i> —A testing program was carried out, but it was not comprehensive enough. As a result, the pairing of groups of presumably equal intelligence could not have been very accurate		2.5
6. <i>The adequate reporting of the experiment</i> —Conclusions resulting from this experiment were reported under four generalizations, namely: a comparison between the achievement ratings of bright and dull pupils; retention results; time element; and comparative costs. This is a fair report of the problem		3.0
7. <i>Provision for the possibility of repetition of the study in further research in the same field</i> —There is need for further research on this problem, in that the study could be carried on in greater detail. Also, a study should be made in regard to the achievement of bright and dull pupils under each method. Type of teacher using each method, class size, and other problems should be studied also		2.0
Total rating		26.8
Possible score		35.2

^aF. G. Anibel, "Comparative Effectiveness of the Lecture-Demonstration and Individual Laboratory Method," *Journal of Educational Research*, 13: 355-365, 1925.

is an illustration of a student's analysis and scoring of a selected report of a piece of experimental research. Evaluate his criticisms. Are they pertinent and intelligent?

D. Summary

A general open-minded experimental attitude toward problems met in any realm of activity should take concrete form as carefully controlled experimental research, wherever the conditions of the situation permit. This is often possible in both the natural and the social sciences.

Laboratory experimentation and group experimentation are two forms which reflective thinking of this type takes. The first deals with individual change and development; the second uses group situations. Five modes of discovering truth are discussed; and the second, that of determining differences, is the method of experimentation in controlled situations. Three types of controlled-group experiments are the one-group, the equivalent-groups, and that involving the rotation of factors or groups.

Criteria for experimental research are found among the thinking activities of reputable scientists, when they are engaged in studies of the operation of controlled variables in any situation. At least seven basic considerations should guide: careful definition of an important, feasible problem; minute definition of the experimental factors; selection of the best techniques for the experimental setup; control of all factors in accord with the law of the single variable; administration of an adequate testing program; a detailed readable report of research experiences and results; and definite provision for repetition of the experiment and for further research in the field of inquiry.

E. Research Exercises

1. Using all pertinent data to be gleaned from Chapters I–VIII, including the footnote material, make a frequency table of *important criteria for experimental research* similar to the list of general research traits in Table I, Chapter II.
2. Select the ten most important of these criteria, compare them with the rubrics on the score card given as Table XVII, and use them in an analysis of the research report scored in Table XVIII.
3. May a public school classroom teacher take the experimental attitude toward his work? Illustrate. Does this involve the setting up and carrying through of minutely organized controlled experiments? ⁵³

⁵³ B. R. Buckingham, "The Public-school Teacher as a Research Worker," *Journal of Educational Research*, 11: 235–243, 1925; and *Research for Teachers*. New York: Silver, Burdett and Company, 1926; Douglas Waples and

4. Answer the same question in the case of the public school administrator (a) in the lower schools, and (b) in institutions of higher education.
5. Cite and analyze four examples of laboratory experimentation that have made distinct contributions (a) to human living; (b) to classroom methods in education; (c) to the work of the executive officer in manufacturing; and (d) to the administrator in education.
6. Cite and analyze controlled-group experiments that have been outstanding contributions in the four fields of activity given in 5.
7. Cite and analyze an experiment in terms of J. S. Mill's five methods of inquiry, determining which canons apply.
8. Cite and analyze an experiment in natural science that employs a combination of group methods.
9. Cite and analyze an experiment in the social science field that uses a combination of group methods.
10. Where does the survey technique come in the procedures of experimental research? Illustrate.
11. When is it justifiable to omit the initial test in controlled experimentation? Illustrate.
12. What is the function of the rotation method of experimentation with regard to obtaining group equivalence? Illustrate.
13. Should differences of development or achievement obtained in group experimentation which are negative be rejected in the final report? If not, how should they be interpreted?

F. Additional Illustrations of Experimental Research

1. *The One-Group Type.*

- a. Tsura Arai, *Mental Fatigue*. Contributions to Education. New York: Teachers College, Columbia University, 1912, No. 54.
- b. B. T. Baldwin, *Physical Growth of School Children*. Iowa City, Iowa: State University of Iowa, 1919.
- c. Genevieve L. Coy, *Interests, Abilities, and Achievements of a Special Class of Gifted Children*. Contributions to Education. Teachers College, Columbia University, 1923, No. 131.
- d. H. N. Glick, *Effects of Practice on Intelligence Tests*. Urbana, Ill.: Bureau of Educational Research, University of Illinois, 1925, Bulletin No. 27.
- e. C. H. Judd, *et al.*, *Reading: Its Nature and Development*. Chicago: University of Chicago Press, 1918.
- f. W. S. Leonard and B. D. Wood, *The Student and His Knowledge*. New York: Carnegie Foundation for the Advancement of Teaching, 1938, Bulletin No. 29.

R. W. Tyler, *Research Methods and Teachers' Problems: A Manual for Systematic Studies of Classroom Procedure*. New York: The Macmillan Company, 1930.

g. G. M. Whipple, *Classes for Gifted Children*. Urbana, Ill.: National Society for the Study of Education, 1920, Yearbook XIX, Part I.

2. *The Equivalent-Groups Type.*

a. F. G. Anibel, "Comparative Effectiveness of the Lecture-Demonstration and Individual Laboratory Methods," *Journal of Educational Research*, 13: 355-365, 1926.

b. W. A. Brownell, K. G. Keuhner, and W. C. Kein, *Learning as Reorganization: An Experimental Study in Third Grade Arithmetic*. Research Studies in Education. Durham, N. C.: Duke University Press, 1939, No. 3.

c. J. S. Butterweck, *The Problem of Teaching High-School Pupils How to Study*, Contributions to Education. New York: Teachers College, Columbia University, 1926, No. 237.

d. S. A. Courtis, "Measuring the Effects of Supervision in Geography," *School and Society*, 10: 61-70, 1919.

e. M. S. Pittman, *The Value of School Supervision*. Baltimore: Warwick and York, 1921.

f. E. K. Sexton and J. S. Herron, "The Newark Phonics Experiment," *Elementary School Journal*, 28: 690-701, 1928.

g. Dora V. Smith, *Class Size in High School English*. Minneapolis: University of Minnesota Press, 1931.

3. *The Rotation Type.*

a. W. H. Heck, *A Study of Mental Fatigue*. Lynchburg, Virginia: J. P. Bell Company, 1913.

b. R. L. Hoke, "Factors Conditioning Efficiency in a Motor Skill," *Journal of Experimental Psychology*, 15: 316-320, 1932.

c. J. V. Lacy, "The Relative Value of Motion Pictures as an Educational Agency," *Teachers College Record*, 20: 452-465, 1919.

d. E. L. Thorndike, W. A. McCall, and J. C. Chapman, *Ventilation in Relation to Mental Work*. New York: Teachers College, Columbia University, 1916.

e. E. L. Thorndike and W. A. McCall, "Educational Research and Statistics: The Effects of Outside Air and Recirculated Air Upon the Intellectual Achievement and Improvement of School Pupils," *School and Society*, 3: 679-684, 1916.

f. E. L. Thorndike and G. J. Ruger, "The Effects of Outside Air and Recirculated Air Upon the Intellectual Achievement and Improvement of School Pupils: A Second Experiment," *School and Society*, 4: 260-264, 1916.

CHAPTER X

The Philosophical Type of Research

THE THESIS of this book is that all creditable research is in terms of ordered reflective thinking. Out of a more or less definite feeling of need, a problem emerges and takes concrete form. A solution is sought in terms of likely hypotheses, accepted tentatively, examined objectively, evaluated through all evidence obtainable, and finally corroborated as the most general conclusion appearing at that time. This is then examined for prognostic values.

A. Reflective Thinking in Philosophy

Can anything in the name of philosophical thinking fit into this pattern?¹ Obviously, the answer depends upon definition; and there is some confusion and much difference of rather shallow opinion as to what philosophy is. A dean in a small arts college was approached by the program committee of an academy of science. He replied by letter at some length explaining in detail that he was not a scientist. He was a philosopher and would have no contribution to make at the next convention of scientists. But the facts were that he was taking a very concrete interest in the reorganization of the curriculum of his college, which had received a subvention from an eastern foundation for the project. He was acting like a scientist, but scorned to be anything but a philosopher. Very probably he meant that he was not interested in work in the natural science realm. He was a social scientist. Furthermore, his constant objective was the deduction of large, worth-while generalizations from whatever reflective thinking he engaged in as college teacher and administrator. His attitude was concretely scientific and at the same time philosophical.

¹ H. A. Clugston and R. A. Davis, "Is a Scientific Method Possible for Philosophical Research in Education?" *Education Administration and Supervision*, 16: 293-299, 1930; F. L. Whitney, "Some Limitations of the Scientific Method in Education," *Hawaii Educational Review*, 17: 102-104, 1929.

Is this possible? The Dewey-Kelley analysis of the reasoning process, given in Chapter I, would seem to say that it is. Among the six steps in the act of reflective thought, a philosophical attitude should be taken at two points at least. In settling on the ultimate objective of the research project (Chapter V), as large a view as possible of the problem solution sought is taken. The widest, most significant possible generalization in the field of inquiry is conceived for investigation as hypothesis. The more general, the more philosophical this tentative solution is, the more valuable will be the entire research. And, at the close of the process of reflective thinking, the crowning act consists of confirmation of tried conclusions reached in terms of their philosophical worth, of their certainty and value in prediction of future status.

Further, in the field of education, F. N. Freeman of the University of California calls attention to the fact that philosophy should be primarily concerned with a search for qualitative values, as leading to things done. "Science can, in this view, evaluate the means, but not the ends; it can estimate the efficiency of the process, but cannot determine or even influence its direction. It has, therefore, gone about as far as it can in improving education. For further advance, it may be asserted, we must turn to an essentially different inquiry, the discovery or rediscovery of the basic values that underlie education. This is to be made by independent and self-sustaining thought or reflection. Science has shot its bolt. It remains for philosophy to take the field.

"This contrast between science and philosophy is common—perhaps it is common sense. Possibly, however, it is not the final word. May science not contribute in genuine fashion to philosophy, and may not philosophy, after all, be assimilated to science? Does not the temper of mind generated by science demand a new philosophical method and point of view, one in which the line between the two disciplines becomes obliterated?"²

It is seen that the philosophical type of research may be defined as reflective thinking on levels of extensive generalization, above the realm of fact-finding science. As explained in Chapter I, just as science deals with specifics of experience and generalizations of relatively narrow import, philosophy takes the conclusions of science in related realms and uses these facts as the raw material for further reflection, coming out with larger and more inclusive points of view in terms of values closer and closer to everlasting truth.

"When we restrict our effort to science, the method of accuracy, we

² F. N. Freeman, "Concluding Comments and Remarks on the Province of Scientific Inquiry," Chapter XXXIX in F. N. Freeman, *et al.*, *The Scientific Movement in Education*. Chicago: National Society for the Study of Education, 1938, Yearbook XXXVII, Part II, p. 488.

fail to move on to greater prophecy, the method of qualitative adequacy. The two are mutually dependent. Both are indispensable parts of the whole thinking."³

John Dewey cautions that the ultimate end and aim of ordered reflection should not be conceived of as in the realm of a *a priori* speculation or as leading only to a final good "complete in independence of practical activity." ". . . the work of philosophy is confined to the things of actual experience. Its business is criticism of experience as it exists at a given time and constructive projection of values, which, when acted upon, will render experience more unified, stable, and progressive. Defects and conflicts of experience as it exists demand thorough going criticism of its contents and procedures. This phase of inquiry is not, however, final; criticism does not end with mere intellectual discrimination. It provides the basis for protection of values as yet unrealized, values that are to be translated into ends that move men to action. Philosophy thus conceived does not involve flight and escape to that which is beyond experience. It is concerned with making the most possible out of experience, personal and social."⁴

Philosophical investigation should not be thought of as a basic method of research. It is a place, a level of value, where reflective thinking is going on. Its separate treatment here is justified by its supreme importance. The viewpoints, the attitudes, and the philosophies of individuals and of social groups and nations shape their earthly destinies.⁵

Any certainty that may be discovered in the data of philosophy ought to raise the unthinking muddling-through of human group existence nearer to a level of ordered living. Philosophers, frontier thinkers, have always been sadly needed. We believe that this need is now most crucial, because we do not know the past and are nearer to the present. The status of modern education and modern economics and politics is fundamentally not much, if at all, above Greek culture. The outstanding philosopher is lacking in every field of human activity. However, present leaders should be nourished and commended for any level of far-sighted thinking that they do engage in, but they should be condemned for refusing to learn philosophically from the past experience of the race. It is the function of philosophical research to

³ R. B. Raup, "On Making Research Significant and Vital," *Advanced School Digest*, 6: 1-11, 1940.

⁴ John Dewey, "The Determination of Ultimate Values or Aims Through Antecedent or a Priori Speculation or Through Pragmatic or Empirical Inquiry," Chapter XXXVIII in F. N. Freeman, *et al.*, *op. cit.*, pp. 471, 472; and *Experience and Education*. New York: The Macmillan Company, 1938.

⁵ Lecomte du Noüy, *Human Destiny*. New York: Longmans, Green and Company, 1947.

point out the supreme value of reflective thinking on the level of the largest generalizations of widest import, to give information about the methods and techniques of philosophical reasoning, and to stimulate to whatever ordered research is possible on this level of reflection.

In confirmation of these statements, it is suggested that the student review carefully the content of Chapter I at this point, in particular the directly quoted portions. A high degree of identity is found there among the concepts—reflection, science, and research. Creditable, effective research is in terms of ordered thinking, and the scientist works through the procedures of problem, hypothesis, inductive and deductive solution, and prognosis—all with the purpose of establishing as wide, as philosophical, a basis for action as possible.

The conclusion is that the philosopher-scientist is the reflective thinker of most economic and social value to mankind. There should be this element of far-thinking in the case of every well-conceived research project. If this is not true, the results may never go beyond the level of unimportant triviality.⁶ Further, it is significant to note the increasing preponderance of philosophical content in the writings of the world's greatest natural scientists.⁷ As they reach later life, they become philosophical in thought process and content.

One reason why the philosophical element in research is of supreme importance is that the thing to be done, human conduct, is determined in terms of the largest value that is discovered in any situation of possible activity. It is true that science itself furnishes knowledge, feeling motivates, but the act is always in terms of generalized points of view that are held.⁸ T. L. Kellëy⁹ emphasizes this by characterizing the first steps in the reflective process as both philosophic and scientific. He claims that necessary long-time experimental verification with corroboration of findings and final prognosis are acts of science alone. But this is only a matter of definition. The point of

⁶ H. W. Holmes, "The Philosophic Element in Scientific Method," *School and Society*, 41: 41 ff, 1935.

⁷ J. H. Jeans, *The New Background of Science*. Cambridge, England: The University Press, 1933; R. A. Millikin, *Evolution in Science and Religion*. New Haven: Yale University Press, 1927; W. M. Davis, "The Faith of Reverent Science," *Scientific Monthly*, 38: 395-421, 1934; Karl Mannheim, *Man and Society in an Age of Reconstruction*. New York: Harcourt, Brace and Company, 1940, pp. 172 ff, 237 ff.

⁸ H. G. Hullfish, "The Relation of Philosophy and Science in Education," *Journal of Educational Research*, 20: 159-164, 1929; Renée von Eulenburg-Wiener, *Fearfully and Wonderfully Made: The Human Organism in the Light of Modern Science*, "Introduction." New York: The Macmillan Company, 1938, pp. 1-6.

⁹ T. L. Kelley, "The Scientific Versus the Philosophic Approach to the Novel Problem," *Science*, 71: 299, 1930.

view of Chapters I and X is that there is an identity of procedure in all true reflective thinking, the difference between science and philosophy being only in the basic material with which they work and the level of value at which they arrive. W. H. Kilpatrick summarizes this by saying that "all good philosophizing takes its facts from the best available scientific authority." William James, the famous American pragmatic psychologist-philosopher, held that philosophy is "only thinking about things in the most comprehensive possible way."¹⁰

Before the rise of the renewed interest in the inductive method under Bacon, whatever reflection occurred was too often that of the schoolmen of the dark Middle Ages. It was pseudo-philosophy with no basis of scientifically determined fact. Generalizations were picked out of the blue heavens, or most often obtained from Aristotle, and maintained with closed-minded prejudice. When true thought began to be fashionable, it was called natural philosophy and later science. In modern times, the true philosopher is at the same time a scientist. If he is not actually engaged in scientific research, he understands its methods and techniques, so that he can use its findings for further thinking on a higher level of values. An outstanding example is John Dewey. As educational scientist, he worked in the experimental laboratory school at the University of Chicago. Later, as world-recognized educational philosopher, he helped to guide modern educational thinking in terms of worth-while goals of scientific effort.¹¹

B. Research in the Field of Philosophical Values

If philosophy is reflective thinking in the field of most general qualitative values—differing from science only in locus and in data used—philosophic research by any creditable basic method or accepted type should be possible. Surveys and analyses of inclusive points of view, classified and interpreted skillfully, would be descriptive research (Chapter VII). The tracing of trends of attitude, theory, or ultimate purpose through the past would be the historical method (Chapter VIII). A check of individual traits or the ordered tryout of

¹⁰ W. H. Kilpatrick, "The Relation of Philosophy to Scientific Research," *Journal of Educational Research*, 24: 97-114, 1931; William James, *Some Problems of Philosophy*. New York: Longmans, Green and Company, 1911, p. 25.

¹¹ John Dewey, *The School and Society*. Chicago: University of Chicago Press, 1900; M. H. Thomas and H. W. Schneider, *Bibliography of John Dewey*. New York: Columbia University Press, 1929; C. E. Ayres, "Dewey and his *Studies in Logical Theory*" in Malcolm Cowley and Bernard Smith, *Books That Changed Our Minds*. New York: Doubleday, Doran and Company, 1939, pp. 110 ff; John Dewey, "The Philosopher-in-the-Making," *Saturday Review of Literature*, 30: 9, 39-44, 1949.

economic or social theories in group or nation would be laboratory or controlled-group experimentation (Chapter IX). A genetic study of the origin of important human generalizations, following their trend through an experimental period in the present and estimating their status in the future, would be prognostic research of the most valuable kind (Chapter XI). The most important procedures in curriculum research (Chapter XIV), the determination of ultimate aims for course content, as well as the underlying assumption for all educational effort, the ultimate-ultimate objective, are acts of philosophy. Sociological research may deal with widely conceived group philosophies of high importance (Chapter XII). And it may be that in creative research (Chapter XIII) the telic element may envisage in its purpose values of wide philosophic import. A brief search will be made for illustrations of these methods of research on the level of philosophical content.

It is not difficult to find examples of philosophical analysis and interpretation in this field of large values. But the majority of these studies, although worth while on their own level, do not carry their procedures beyond the technique of documentary examination. They are valuable as preliminary studies, but they are not clear-cut examples of reflective thinking. They are not creditable research. This has to be true of most masters' theses. If a beginning graduate student is permitted to attempt an investigation of this type of material at all, there is seldom an inclusive background of basic reading to begin with, nor is there ability to use the data involved reflectively, nor length of time available to make a complete study.

One such analysis is that of H. N. Spencer¹² at Colorado State College of Education. Here the ultimate aim, as stated, was to offer criticism of modern educational theory and practice in utopian theories. Procedures followed were: (1) summarize utopian literature in general for the larger generalizations;¹³ (2) study utopian educational theories, purposes, educands, teachers, institutions, curriculums, and methods;

¹² H. N. Spencer, *Contributions to Education from the World's Great Utopias*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1927.

¹³ Aurelius Augustine, *The City of God*. Edinburgh, Scotland: T. and T. Clark, 1871; Francis Bacon, *New Atlantis*. Cambridge: Harvard University Press, 1919; Edward Bellamy, *Looking Backward*. New York: Houghton Mifflin and Company, 1898; Thomas Campanella, "The City of the Sun," *Ideal Commonwealths*. New York: P. F. Collier and Son, 1901; Thomas More, *Utopia*. New York: Clarendon Press, 1904; William Morris, *News from Nowhere*. New York: Longmans, Green and Company, 1903; Plato, *The Republic*. Washington, D. C.: M. Walter Dume, 1901; H. G. Wells, *New Worlds for Old*. New York: The Macmillan Company, 1919; James Harrington, "Oceana," *Ideal Commonwealths*. New York: P. F. Collier and Son, 1901.

(3) analyze current education at Colorado State College of Education, the University of Colorado, and a liberal-arts college, from the point of view of the pronouncements of Herbert Spencer, J. F. Bobbitt, John Dewey, F. J. Kelly, and W. H. Kilpatrick, and in terms of the "seven cardinal aims of education";¹⁴ and (4) compare the two groups of theories to find any of the older generalizations that may be applicable to the present educational situation. It will be seen that there is possibility for reflective thinking in this last procedure.

Another investigation in the field of philosophy is characterized in the title as an "analysis."¹⁵ However, this study is found to offer illustration of some degree of reasoning in that it comes out at the end as larger and wider generalizations than it began with. The main purpose of the research was to develop individual and usable points of view on world friendship. This is stated analytically under three heads:

1. The development of an underlying philosophy or set of principles governing an educational program for world understanding and world friendship in line with the thinking of school people of the United States and other nations, and of representative men and women of other professions.

2. The development of principles governing the training of teachers with a view to enabling them to give effectively instruction which will lead to world understanding and world friendship on the part of children later to be in their charge.

3. The development in the elementary and secondary schools of a policy relating to the actual teaching of world understanding and world friendship, including principles governing the organization of the work and special materials and devices to be employed.

A preliminary survey of all literature on education for world under-

¹⁴ Herbert Spencer, *Education: Intellectual, Moral, and Physical*. New York: D. Appleton-Century Company, 1900; J. F. Bobbitt, *The Curriculum*. Boston: Houghton Mifflin Company, 1918; John Dewey, *The School and Society*. Chicago: University of Chicago Press, 1900; F. J. Kelly, *The American Arts College*. New York: The Macmillan Company, 1925; W. H. Kilpatrick, *Source Book in the Philosophy of Education*. New York: The Macmillan Company, 1923; C. D. Kingsley, et al., *Report of the Committee on the Reorganization of Secondary Education*. Washington, D. C.: United States Bureau of Education, 1918, Bulletin No. 35, 1918, pp. 11-15.

¹⁵ H. L. Smith and L. M. Chamberlain, *An Analysis of the Attitude of American Educators and Others toward a Program of Education for World Friendship and Understanding*. Bureau of Cooperative Research Bulletin No. 4. Bloomington, Ind.: Indiana University, 1929; H. L. Smith and S. G. Crayton, *Tentative Program for Teaching World Friendship and Understanding in Teacher Training Institutions and in Public Schools for Children Who Range from Six to Fourteen Years of Age*, Bureau of Cooperative Research Bulletin No. 5. Bloomington, Ind.: Indiana University, 1929.

standing was made, and the viewpoints of about one hundred persons were collected. The resulting list of generalizations was studied at the Toronto meeting of the World Federation of Education Associations in 1927. Then definite lists of "Theses" were prepared for evaluation and revision.

The first work of the study was with sixteen "General Theses," although other sections dealt with principles for the organization of a curriculum in this field. The reaction of 650 educators, professional people, and businessmen, in the United States and Canada, was obtained toward the general theses. As an indication of changes made in them by the thinking of the group, the first four are now given in original and in final form.

ORIGINAL THESES

1. The really important task before the world today is the creation of a new state of mind which will transcend national boundaries.
2. Double loyalty, that is, loyalty at the same time to both the nation and to mankind as a whole, should not be a more difficult concept to grasp and hold than is the concept of loyalty to both city and nation or the concept of loyalty to both family and city.
3. It is, therefore, possible to develop, in the individual, world understanding and international-mindedness without loss of national interest and loyalty.
4. Such world understanding and international-mindedness on the part of individuals is an objective worthy of the best efforts of any or all institutions of modern society.

CHANGED THESES

1. An important task before the world today is the creation of a new state of mind, a state of mind which will permit an understanding and appreciation of the character, attainments, and traditions of other peoples, and which will transcend national boundaries without seeking to destroy them.
2. Loyalty to both the nation and to mankind is a concept similar to that of loyalty to both city and nation and, while it may be somewhat more difficult to grasp and hold, it is equally desirable and attainable.
3. It is, therefore, possible to develop, in the individual, world understanding and good will without loss of any quality really essential to a desirable national citizenship.
4. Such world understanding and good will on the part of individuals is an objective worthy of the best efforts of all institutions of modern society that are by their nature fitted to share in the undertaking.

The authors do not claim that the study is anything but preliminary with tentative results. They say that it should use more inclusive lists of generalizations and should be carried into other countries. In particular, they suggest as further research:

(1) The promotion of experimental investigations to determine the relative effectiveness of different administrative devices, and of different teaching methods; and (2) the development of inventory and achievement tests which may be used for the purpose of distributing teaching emphasis and for measuring the results of the instruction.

A clear-cut example of *descriptive research* on the level of philosophical values is found in Norman Woelfel's¹⁰ doctor's dissertation at Teachers College, Columbia University. In his report Woelfel starts with a detailed statement of his own view of American social life in general and in particular of public education. Then he analyzes the thinking of seventeen American educational theorists and criticizes their philosophies interpretatively in the light of his standpoint at the beginning of the research. Finally, he gives in summary form a wider point of view, applicable to a "genuine professional solidarity and integrity" for educators, under the heads of (1) social aims and (2) teaching aims.

His classification of American educators is significant. This is in terms of whether "their major sympathies 'lie' in the direction of inherited traditions, modern science, or modern naturalistic philosophy." The analysis for each consists of: (1) general viewpoint and its relation to education, (2) nature of current educational practice, (3) nature of learning, and (4) reactions to other points of view.

MOLDERS OF AMERICAN EDUCATION

a. *Educators Stressing Values Inherent in American Historical Traditions*

- (1) H. H. Horne, New York University.
- (2) H. C. Morrison, University of Chicago.
- (3) W. C. Bagley, Teachers College, Columbia University.
- (4) E. P. Cubberley, Stanford University.
- (5) T. H. Briggs, Teachers College, Columbia University.
- (6) R. L. Finney, University of Minnesota.

b. *Educators Stressing the Ultimacy of Science*

- (7) C. H. Judd, University of Chicago.
- (8) David Snedden, Teachers College, Columbia University.
- (9) E. L. Thorndike, Teachers College, Columbia University.
- (10) Ernest Horn, State University of Iowa.
- (11) W. W. Charter, Ohio State University.
- (12) Franklin Bobbitt, University of Chicago.

c. *Educators Stressing the Implications of Modern Experimental Naturalism*

¹⁰ Norman Woelfel, *Molders of the American Mind: A Critical Review of the Social Attitudes of Seventeen Leaders in American Education*. New York: Columbia University Press, 1933.

- (13) John Dewey, Teachers College, Columbia University.
- (14) G. S. Counts, Teachers College, Columbia University.
- (15) W. H. Kilpatrick, Teachers College, Columbia University.
- (16) Harold Rugg, Teachers College, Columbia University.
- (17) B. H. Bode, Ohio State University.

Historical research on the level of philosophy is well illustrated in the investigation of J. B. Bury,¹⁷ formerly of Cambridge University. Here the concept of progress, together with contrary and pessimistic attitudes, is traced from early Greek times to the present. Analyzing the Greek and Roman idea of the cyclical movement of history in a direction of decadence, he attempts to trace the facts of trend, to determine the truth with regard to the doctrine of progress. The details of the interpretation should be tabulated or briefed for thorough understanding. Important steps are: (1) the Greek belief in a golden age of the past never to be repeated, in cycles of endless iteration on the same level, and in the impiety of trying to rival the gods by striving for excellence; (2) the Roman acceptance of this attitude of hopelessness toward any possible improvement of humanity; (3) the belief of the Dark Ages in original sin and progress to another world, but continued misery in this; (4) the Italian Renaissance acceptance and glorification of all classical attributes and cultures; (5) the glimmer of optimism in the sixteenth and seventeenth centuries, with their utopian societies in some far distant region of imagination; (6) the first successful attempt to popularize the theory of progress by Fontenell; (7) its transfer from the natural to the social science realm by French thinkers led by Saint-Pierre; (8) Rousseau's revival of the golden-age idea in his Arcadian doctrine; (9) the optimism originating in the American and the French Revolutions; (10) the search for a law of progress in the nineteenth century culminating in the birth of sociology under Comte; (11) the emergence of the theory of evolution which led toward both optimism and pessimism; and finally, (12) the modern progress in natural science.

This is an excellent example of the investigation of a philosophical generalization over long historical periods. It is historical research in the field of philosophical data. Note, also, an excellent analysis and evaluation of the concept of progress in the realm of sociology.¹⁸

Clear-cut cases of *experimental research* among philosophical ideas and attitudes are more difficult to find. There are, of course, all of

¹⁷ J. B. Bury, *The Idea of Progress: An Inquiry into its Origin and Growth*. New York: The Macmillan Company, 1920; H. W. Smith, "Kamongo" in Alexander Woolcott, *The Woolcott Reader*. New York: Viking Press, 1935.

¹⁸ E. B. Woods, "Progress as a Sociological Concept," *American Journal of Sociology*, 12: 779-821, 1907.

the trials of doctrines of government from despotism to democracy found in the history of nations. But to say that they are controlled experimentation in the laboratory sense would not be possible. It may be that present experiments with fascism, communism, and democracy come very near to scientific research. In particular, in Soviet Russia, we have seen a well-conceived philosophical point of view objectively stated, and agenda of procedures set up in five-year plans toward definite economic and social goals.¹⁹ In a master's report at the University of Colorado, theories of education in modern Russia and a check of their efficiency in progress toward the abolition of class are found.

The purpose of this study was to determine whether communist educational theory and educational practices in the Soviet Union offer adequate tools for the transformation of present Soviet society into a truly classless communist society.

An investigation of the writings of Marx, Engels, Lenin, Stalin, and their critics revealed that the main principles of Soviet educational theory are contained in the general philosophy of communism, and arise logically from the dialectical materialism of Marx, his theory of revolution, his theory of knowledge, and his concrete educational views.

Treatises on Soviet education by both Soviet and foreign authorities, and certain official communist publications on education show that the most fundamental characteristics of Soviet education are: (1) "proletarianization" through indoctrination and appropriate habit formation; (2) the role of productive or socially-useful labor in all educational practices, as the center of integration of all programs of instruction, as well as the center of integration between educational institutions and society; (3) civic training as offered by various organs of the Soviet social structure and by organizations in educational institutions.

Through the emphasis placed by all educational institutions on the three basic features, Soviet education represents a powerful medium for the construction of communist society.²⁰

An actual example of controlled experimentation involving the investigation of philosophies of science instruction is found in G. W. Haupt's doctor's dissertation at Teachers College, Columbia University. Two basic points of view with regard to science teaching of young children are analyzed: (1) One assumes that large generalizations may be developed by pupils, through experiences that lead to explanation

¹⁹ W. F. Dummer, "Philosophy Back of the Five-Year Plan," *American Journal of Sociology*, 38: 595-602, 1933.

²⁰ A. F. Ehrenburg, "The Educational Ideas of the Leaders of Communism and Their Application in the Soviet Union," in Francis Ramaley, editor, *Abstracts of Theses for Higher Degrees, 1934*. Studies, 22: 20-21. Boulder, Colo.: University of Colorado, 1934.

and interpretation; and (2) the other assumes the opposing view, that children are not capable of functioning mentally in terms of large generalization and that instruction should be organized as observation only. It is the first philosophy that is investigated in this study.

One assumption of the philosophy tested is that its application necessitates particular kinds of mental processes. Another is that young children are capable of these mental processes. The study contributes experimental data bearing upon the kind of mental process which is thus involved and tests its possibilities and characteristics with children of the first six grades of an elementary school.

A third assumption of the philosophy tested is that a practical gradation can be effected by use of the objective type of aim. The study contributes experimental data bearing upon the possibilities and characteristics of such a continuous gradation by use of the objective type of aim.²¹

The investigation used the one-group method of experimentation with six groups of pupils of about thirty each in the Horace Mann Elementary School in New York. Tests were given before and after a period of instruction, and results were analyzed to determine the extent to which learning resulted in generalization.

An example of *prognostic research* in the realm of philosophical thinking is furnished by Ramona S. Hibbs' ²² master's report at Colorado State College of Education. The data of this study were such concepts as God, prayer, Bible, Jesus Christ, creation, and immortality. The main problem was to determine the nature of the influence of higher education on these ideas, and thus to establish the probability of trend from naïveté through orthodoxy to heterodoxy or atheism among young people under the influence of college life. Groups of high school and college students and a noncollegiate sampling of college age were used. Questionnaires were prepared for each of the six philosophical viewpoints. The scores from naïveté to heresy were correlated with the average number of hours of credit for each level of response in courses in sociology, philosophy, anthropology, geology, psychology, and biology. The relationship was found to be high, and the prediction was that with the development of a more objective, scientific attitude would come noticeable changes in religious beliefs. This prognosis was generalized, perhaps unwarrantably, for all college groups under similar tuition.

²¹ G. W. Haupt, *An Experimental Application of a Philosophy of Science Teaching in an Elementary School*. Contributions to Education. New York: Teachers College, Columbia University, 1935, No. 633.

²² Ramona S. Hibbs, *An Investigation of the Influence of Higher Education on Religious Concepts*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

The importance of and necessity for research, ordered reflective thinking, on this higher level of qualitative values cannot be over-emphasized. In one of his lectures, total personality was compared to an iceberg by G. S. Hall, formerly president of Clark University. The intellect is more visible and is liable to engage most unthinking attention. But there is the other segment of personality, the nine tenths submerged below the surface. This is actuated by the deep tides of emotion and swept along often to unconsidered goals. It is well known that attitudes and behavior are most often the result of the feeling tone of the situation, not a decision of that little peak of intelligence above the surface of human relations. We act too often in terms of how we feel, not because we think and know. The determination, the measurement, and the education of this major part of the total is, then, of first importance. It is a field of research which many should enter in order that more progress may be made beyond the work of the present pioneers.

There simply must be a courageous attack upon the problem of measurement of other than intellectual factors. It is becoming increasingly obvious that matters of temperament and character are of very great importance, that they operate quite largely independent of intelligence, and that prognosis problems cannot be adequately understood without an evaluation of these factors.²³

Some progress has been made in the analysis of this more important phase of personality.²⁴ Perhaps, in the construction of tools and techniques, a point has been reached similar to that in the measurement of achievement in spelling and number of thirty years ago. Witness the list of seventy-eight character tests, as available in 1932, reported by A. L. Threlkeld's committee; the work of Hartshorne and May in the Character Education Inquiry at Teachers College, Co-

²³ S. L. Pressey, *et al.*, "Intelligence and Its Measurement: A Symposium," *Journal of Educational Psychology*, 12: 123-147, 195-216, 1921.

²⁴ A. L. Threlkeld, *et al.*, *Character Education*. Tenth Yearbook. Washington, D. C.: Department of Superintendence, National Education Association, 1932, Chap. XVI; Hugh Hartshorne and M. A. May, *Studies in Deceit*. New York: The Macmillan Company, 1928; Hugh Hartshorne, M. A. May, and J. B. Maller, *Studies in Service and Self-Control*. New York: The Macmillan Company, 1929; Hugh Hartshorne, M. A. May, and F. K. Shuttleworth, *Studies in the Organization of Character*. New York: The Macmillan Company, 1930; R. W. Tyler, *et al.*, *Service Studies in Higher Education*. Columbus, Ohio: Bureau of Educational Research Monographs, Ohio State University Studies, 1932, No. 15; L. L. Thurstone and E. J. Chave, *The Measurement of Attitude*. Chicago: University of Chicago Press, 1929; Farnsworth Crowder, "Their Fingers in the Pie," *Saturday Evening Post*, 213: 39-43, 1940.

lumbia University; of R. W. Tyler (now at the University of Chicago) and his associates at Ohio State University; of L. L. Thurstone at the University of Chicago; and others. More thinkers should enter this field of endeavor, so that many tests may be made for trial, and many studies may be carried through. This is the history of improvement in other areas of measurement.

The attitude of classroom teachers toward this group of problems, as found in their seventh yearbook,²⁵ is promising. Many more or less inexperienced excursions into this field might be cited. Two masters' theses have attempted to check the development of attitudes among the individuals of character-forming organizations. Winnie M. Thomas investigated the South Dakota Young Citizens League, and Francis W. Shaver,²⁶ the Phillips Crusader Boys of Pueblo, Colorado.

In the first study, 814 eighth-grade pupils in the rural schools of ten representative counties of South Dakota were used. The purpose was, in the case of each child, to secure (a) an expression of character ideals, (b) examples of conduct deemed good, and (c) a measure of the consistency of attitude toward conduct of each of the children, together with (d) statements to reveal the attitudes of the pupils toward the work of the League and the types of duties by which these League members had been trained.

The conclusions of the investigation are abstracted as follows:

It appears: (a) That the Young Citizens League is, indeed, effective in building up character ideals in the minds of the children trained through its program; (b) that, while it is not possible to say with assurance that the Young Citizens League work makes children more sensitive to good conduct, there is some evidence to support the belief that the Young Citizens League—particularly when used to give children practice in a suitable variety of the activities for which the program provides—does have a positive influence on a child's ability to see what is good in conduct; (c) that the work in the Young Citizens League does not have an effect upon the average consistency of conduct of its members; though there are indications that, under some conditions, Young Citizens League training may have an effect upon consistency. There are indications that, particularly in regard to this phase of character development, this investigation is inadequate.

The findings of this study confirm the opinions held by those active in

²⁵ F. L. Whitney, *et al.*, *The Classroom Teacher and Character Education*. Seventh Yearbook. Washington, D. C.: Department of Classroom Teachers, National Education Association, 1932.

²⁶ Winnie M. Thomas, *The Achievements in Character Education of the Young Citizens League of South Dakota*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931; Francis W. Shaver, *The Contribution of the Phillips Crusader Boys' Military Bands of Pueblo to Character Development*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1932.

directing the work of the League, that its achievements in character building are worth while.

At Ohio State University, successful attempts have been made to isolate these subtler values associated with the teaching of college subjects, such as ability to generalize, to recognize and apply principles, to infer, to think scientifically, and to appreciate.²⁷

Perhaps the most concrete and objective advance in a study of attitudes is found in the work of L. L. Thurstone and his associates at the University of Chicago. Two studies stand out. In 1929, reports on a number of experiments in the realm of religious attitudes were published. The basic problem was the making of an attitude scale. Forty-five statements of opinion were selected. These included: "I find the sermons of the church both restful and inspiring," "I believe in religion, but I seldom go to church," "I think that the church is a parasite on society," and "The church represents shallowness, hypocrisy, and prejudice." These were scaled and given definite score values. The experimental scale was used with large groups of college students, faculty members, and in the Chicago Forum. The distribution of scores showed the Forum attitudes to be the most antagonistic to the church. "The four undergraduate classes do not show any distinct trend to become more in favor of or more against the church as they progress through college. The graduate students score about the same, on the average, as the undergraduate students."²⁸ These conclusions should be compared with generalizations coming from two masters' reports at Colorado State College of Education.²⁹ In Miss Deubach's study, Forms D and E of the University of Chicago "attitudes toward God" questionnaire were used. Catholics were found to have most traditional attitudes; Protestants, next; and no-church

²⁷ R. W. Tyler, "Measuring the Results of College Instruction," *Educational Research Bulletin*, 11: 253-259, 1932; "Measuring the Ability to Infer," *Educational Research Bulletin*, 9: 475-480, 1930; "Ability to Use Scientific Method," *Educational Research Bulletin*, 11: 1-9, 1932; F. P. Frutchey, "Measuring the Ability to Apply Chemical Principles," *Educational Research Bulletin*, 12: 255-260, 1933; F. P. Frutchey and Edgar Dale, "Testing Some Objectives of Motion-Picture Appreciation," *Educational Research Bulletin*, 14: 34-37, 1935.

²⁸ L. L. Thurstone and E. J. Chave, *The Measurement of Attitude: A Psychophysical Method and Some Experiments with a Scale for Measuring Attitude toward the Church*. Chicago: University of Chicago Press, 1929.

²⁹ Ramona S. Hibbs, *An Investigation of the Influence of Higher Education on Religious Concepts*. Greeley, Colo.: Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931; Vila A. Deubach, *Attitudes Toward God of Colorado State College of Education Freshmen and Seniors*. Greeley, Colo.: Unpublished Master of Arts Thesis, Colorado State College of Education, 1935.

students last. Women were more traditional than men; and freshmen, than seniors.

A more recent attitude investigation has come out of the Payne Fund subvention of the work of W. W. Charters and his group in the field of motion-picture problems. This has resulted in about a dozen reports dealing with the cinema as related to social ideas, content, emotional responses, standards of morality, sleep status, delinquency and crime, and appreciation. The report on the social attitudes of high-school children was in terms of the giving of an attitude test before and after attendance at selected pictures, which had affective value in relation to issues in question. These included attitudes toward race, nationality, crime, war, prohibition, capital punishment, and the like. Agreement or disagreement was checked on theses such as "Wars often right tremendous wrongs," "Prohibition should come as the result of education, not legislation," "The Chinese are pretty decent," "Every criminal should be executed," and "By nature, the Negro and the white man are equal." The general conclusion of the experiments was "that motion pictures have definite, lasting effects on the social attitudes of children and that a number of pictures pertaining to the same issue may have a cumulative effect on attitude."⁸⁰

One of the later studies to emphasize the importance of the affective side of personality is the American Council on Education investigation of emotion as related to education. The objective of the research was ". . . to ascertain . . . the recognition to be accorded emotional factors in the educational process, with special reference to the questions: (1) whether emotion has been unduly ignored in the stress laid upon the acquisition of knowledge and the development of skill in the acquisition of knowledge; (2) whether education should concern itself with the strength and direction of desires developed or inhibited by the educational process; (3) whether the stress laid on the attitude of neutral detachment, desirable in the scientific observer, has been unduly extended into other spheres of life to the impoverishment of the life of American youth; and (4) in the event that it should appear desirable for education to concern itself more directly with the development and direction of emotion to consider by what devices emotion may be more accurately described, measured, and oriented."

The study dealt with feelings, emotions, and emotionally conditioned attitudes. It is the last phase that is of interest as illustrating the philosophical type of research. "An attitude is a mental and neural state of readiness, organized through experience, exerting a directive

⁸⁰ W. W. Charters, *et al.*, *Motion Pictures and Youth: A Summary*. New York: The Macmillan Company, 1933.

or dynamic influence upon the individual's response to all objects and situations with which it is related."⁸¹

"The development of attitudes, ideals, loyalties, and purposes, accomplished by assisting the individual with the organization of his experiences, has always been recognized as an ultimate aim of educators. In former years, it was undertaken by the teaching of precepts and accomplished by the practice of social taboos and group pressure. Now, the swift changes that are coursing through society and the discrediting of precept teaching has left school people talking vague generalities about character education and floundering badly in practice. In contrast, the dictators of other nations and the demagogues of our own nation have not lost the art of winning loyalties and inciting prejudices. They generate emotion, attach it to a concept, and hold their followers well in hand as a consequence." Apparently, the Problems and Plans Committee of the American Council on Education was quite right in its suspicion that "the stress laid on the attitude of neutral detachment, desirable in the scientific observer, has been unduly extended into other spheres of life" and that "education should concern itself with the strength and direction of desires developed or inhibited by the educational process."⁸²

C. Criteria for the Philosophical Type of Research

Important standards for research on the level of the more general values are to be found first of all in the procedures of all effective *reflective thinking*. Has a vague feeling of need crystallized in definite problem form? Has the most reasonable guess of a solution been carefully examined in terms of evidence obtainable? Has this conclusion been corroborated deductively, as well as inductively? Has it been evaluated as basis for prognosis? Most crucial inquiry of all, has action been taken (1) on the basis of brief ill-consideration of the hypothetical solution, or (2) after due, careful, and perhaps long-time experimental examination of all pertinent data of evidence? T. L. Kelley⁸³ has emphasized this distinction between science and poor philosophy (Chapter I). The medieval or the modern pseudo-philosopher holds with true reasoning for the first few steps of reflective thinking. He feels a difficulty. He defines it. He accepts a tenta-

⁸¹ G. W. Allport, "Attitudes" in C. A. Murchison, *Handbook of Social Psychology*. Clark University Press, 1935, p. 810.

⁸² D. A. Prescott, *et al.*, *Emotion and the Educative Process*. Report of the Committee on the Relation of Emotion to the Educative Process. Washington, D. C.: American Council on Education, 1938, pp. 4 ff.

⁸³ T. L. Kelley, "The Scientific Versus the Philosophic Approach to the Novel Problem," *Science*, 71: 295-302, 1930.

tive solution. He elaborates it mentally by shallow excogitation and introspective speculation. Then he accepts it as right, his mind closes, and he acts at once. On the other hand, the true scientific philosopher pauses at steps four and five to consider carefully all objective evidence obtainable on the hypothetical solution. He refuses to act until this evidence is experimental and adequate. If the guessed solution does not meet this test, he examines another, until a verified conclusion appears on which he can act. But, even though this is accepted for the present, he keeps an open mind for new evidence that may throw more light on the situation. The result is that, though the pseudo-philosophic act may be more timely and fill in a pressing present need, the scientific conclusion is more likely to be correct, as well as more worth while for prognosis.

A second criterion for the philosophical method considers its *generality*, its place on the levels of reflective thinking. It is obvious that the wider and more inclusive the concepts under consideration are, the more general value the research project has. Philosophic research of lowest value uses as its raw material the important facts of related areas of scientific thinking, manipulating these reflectively in terms of the usual procedures of true reasoning. But research by this method is of greatest value when the data of evidence used consist of generalizations far up the levels of the thinking process nearer to ultimate truth. For example, in the field of governmental control, there are the principles of group living derived from human individual and social psychology near to home, business, labor, or professional experiences, which are basically important for research activity. But above these relatively restricted theories are the far more inclusive, and so more important, generalizations that involve the considerations of large-group movements of humanity, the trends of social thought and opinion, inclusive attitudes toward nation and world life, and similar philosophical concepts. Thinking is most effective in human welfare when it is in the area of these concepts of largest value.

A third consideration in philosophical thinking is its *economic and social value*. Is it in the area of more or less pure research, removed from the problems of everyday living? Or does it deal with the practical activities and necessary decisions of individual and group experience? Is it experiential? If it has a pragmatic point of view, if it is constantly weighing the "cash value"⁸⁴ of ideas involved, it is perhaps most worth while. However, there is a chance for argument here, and it may be that attempted distinction between pure and applied research is irrelevant, as in many instances pure research be-

⁸⁴ William James, *Pragmatism, a New Name for Some Old Ways of Thinking*. New York: Longmans, Green and Company, 1907.

comes applied research when economic and social applications are discovered (Chapter I). Philosophical thinking has most value when it is most closely related to the actual and ever-recurrent problems of human culture. The well-known classic example of futility here is the alleged reasoning by medieval schoolmen on the problem, "How many angels can stand on the point of a needle?" But modern self-styled philosophies should take care that their mental activities are not as remote as this from the numberless decisions that every man and woman is obliged to make daily.

As in all reflective thinking, an important criterion considers the *method* of research chosen for the solution of the problem isolated.³⁵ The method *par excellence* is, of course, that of controlled experimentation (Chapter IX). However, the discussion of Section B suggests the difficulty of setting up a search for evidence by this method. The data of research on the higher levels of generality must always be relatively undefined and unmeasurable, far more vague and indefinite than the facts of science. Nevertheless, some progress has been made in the definition of expressions of amount here and in the setting up of scales of value. It would seem that E. L. Thorndike's attitude is correct, that "Whatever exists at all, exists in some amount";³⁶ and "can be measured,"³⁷ rough and inaccurate though the first attempts may be. The present status of research on this level of values is characterized in Section B of this chapter. A category of excellence for method may be: (1) the experiment, (2) prognosis, (3) historical trends, and (4) description. However, this will depend upon all of the circumstances of each research project undertaken. It might be, for example, that an intensive check of all of the facts of a present-time situation would give data of evidence for worth-while conclusions. Possibly the study by Norman Woelfel,³⁸ analyzed in this chapter, is an illustration of this. However this may be, there is one method of research, or it may be a combination of types of attack, which best fits the needs of each process of reflective thinking in philosophic research. An important first decision is the skillful choice of this pertinent method.

³⁵ R. B. Raup, "On Making Research Significant and Vital," *Advanced School Digest*, 6: 1-11, 1940.

³⁶ E. L. Thorndike in *The Measurement of Educational Products*. Chicago: National Society for the Study of Education, 1918, Yearbook XVII, Part II, p. 16.

³⁷ W. A. McCall, *Measurement*. New York: The Macmillan Company, 1939, p. 15.

³⁸ Norman Woelfel, *Molders of the American Mind: A Critical Review of the Social Attitudes of Seventeen Leaders in American Education*. New York: Columbia University Press, 1933.

Similar to the second criterion listed above is that which considers an adequate *definition of data* used in the philosophical type of research. The dangers involved in careless or ignorant conception of material found on these higher levels of reflection are ever present and hard to avoid. How many personal differences about intangible things vanish when care is taken to agree on a definition of terms used! A clever editorial comment on a certain ecumenical conference recently called the attention of the brethren to the necessity for defining the philosophical concepts involved before argument could cease. The facts of science are definitely known and clearly understood. Philosophy should strive to approximate this basis of certainty, if there is an expectation that results will be worth while. For example, it may be that whatever measure of success has come to Soviet Russia in her five-year plans is a measure of the detailed grasp that Stalin and his governmental group have of the principles of economics involved. And it may be that saltatory and uncertain progress toward goals set up in modern nationalities is caused by a muddled conception of the data of evidence that should be used in the solution of problems present. It is thought by many that this is an explanation for the present status of public education. It is wandering in circles busy with the important, but not crucial or final, activities of measurement. It is busy with the *what*, but refuses to consider the *what for*.³⁹ It lacks known goals of effort. The data dealt with are too specific in themselves. Large, inclusive, general objectives need to be conceived and agreed upon by educational leaders. The "seven cardinal principles" were proposed in 1918. Beginning in 1937, an official policy-forming committee has been set up by the National Education Association, their Educational Policies Commission.⁴⁰ Careful definition of the data of the philosophical type of research in education is absolutely necessary, if socially valuable aims, purposes, and objectives are to be discovered.

As in all effective reflective thinking, an efficient *measurement program* should give definite information on progress made. Of course, on this level of generality objective measurement is most difficult, but it cannot be assumed that it is impossible. Progress in the isolation,

³⁹ R. S. Lynd, *Knowledge for What?* Princeton, N. J.: Princeton University Press, 1939.

⁴⁰ C. D. Kingsley and others, *op. cit.*; A. J. Stoddard, *et al.*, *The Purposes of Education in American Democracy*. Washington, D. C.: Educational Policies Commission, National Education Association, 1938; C. C. Peters, "The Aims and Objectives of Education," in Myrtle H. Dahl, *The Implications of Research for the Classroom Teacher*. Joint Yearbook, American Educational Research Association and Department of Classroom Teachers. Washington, D. C.: National Education Association, 1939, pp. 299-309.

measurement, and development of personality traits has been discussed. But an informative check on the development of generalizations in group life is more difficult and perhaps must be more subjective. However, the growth of attitudes is quite definitely reported in the study made for the World Federation of Education Associations and already analyzed. Concrete reports on the success of the first five-year plan were made public in Russia. The achievement of principles under science instruction, guided by a chosen philosophy, was reported in terms of correct and wrong responses to test elements. It was possible to report the correlation of changes in religious ideas to course hours in natural and social science as $.85 \pm .033$.⁴¹ The research student should take exactly the same attitude toward the necessity for measurement on this level of inclusive generalization that he does in any effective reflective thinking where effort is futile unless results and progress can be known and reported. All scientific work in the field of the social studies is confronted with this same problem. Every professionally minded student is obligated to make his contribution to the problem of the establishment of units of measurement.

In addition to the six criteria given for creditable research on the level of philosophy, there are the usual standards for all methods of inquiry discussed in preceding chapters. The problem of an effective *classification of data* is equally as difficult as that of measurement. Care should be taken not to use techniques of classification too minute to be warranted by the roughness of the basic material obtained. It is possible to be too meticulously accurate in the calculation of point, spread, and relationship measures. Approximate values are often more meaningful for interpretation. The *final report* should be detailed and adequate, as in all research. It should provide for a *repetition* of the study in another field, with new subjects, and with improved methods and techniques. Finally, a grasp of the total area of problems involved should be shown in concrete suggestions for *further research* needed.

A list of seven criteria for creditable research in the field of philosophical values has been suggested at the School of Education of the

⁴¹ H. L. Smith and L. M. Chamberlain, *An Analysis of the Attitude of American Educators and Others toward a Program of Education for World Friendship and Understanding*. Bureau of Cooperative Research Bulletin No. 4. Bloomington, Ind.: Indiana University, 1929; G. W. Haupt, *An Experimental Application of a Philosophy of Science Teaching in an Elementary School*. Contributions to Education. New York: Teachers College, Columbia University, 1935, No. 633; Ramona S. Hibbs, *An Investigation of the Influence of Higher Education on Religious Concepts*. Greeley, Colo.: Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

University of Colorado.⁴² These are in general in accord with the student-faculty analysis given later. (a) Is the problem clearly defined and delimited? (b) Are the data derived through critical observation? (c) Do suggestions arise naturally from the data to clarify the problem? (d) Is inference based upon objectively tested evidence? (e) Are hypotheses consistent with all known facts? (f) Do hypotheses predict, explain, or suggest? (g) Are hypotheses susceptible of verification by further investigation?

The ten Colorado State College of Education criteria for good philosophical research, devised by graduate student groups, are listed in score-card form in Table XIX. It is suggested that they be revised again, before being used, as described in Chapter VII. In Table XX is found an evaluation of a specific research report in this realm of philosophical values.

TABLE XIX
A SCORE CARD FOR RESEARCH ON THE LEVEL OF PHILOSOPHY

Criteria	Scales		
	Low	Medium	High
1	2	3	4
1. Reflective thinking	6.0	7.0	8.2
2. Generality of values	5.0	6.1	7.0
3. Economic and social worth	4.7	5.8	6.3
4. Proper method	4.5	4.9	5.8
5. Definition of data	4.0	4.5	5.2
6. Measurement program	3.5	4.0	4.8
7. Classification of material	2.9	3.4	4.2
8. Final report	2.4	3.0	3.7
9. Repetition of the study	1.5	2.1	3.0
10. Further research	1.0	1.4	1.8
Perfect score (total)			50.0

In addition to this score card, it is possible and perhaps just as desirable to use any one of the three completed tools, given in Chapters VII, VIII, and IX, which corresponds to the basic method of research employed in the study in philosophy under way. If the

⁴² H. A. Clugston and R. A. Davis, "Suggested Criteria for the Philosophical Method of Research in Education," *Educational Administration and Supervision*, 16: 575-580, 1930; "Is a Scientific Method Possible for Philosophical Research in Education?" *Educational Administration and Supervision*, 16: 293-299, 1930.

method is that of descriptive research, Table XII may be used; if it is historical research, Table XIV; if experimental research, Table XVII.

D. Summary

Philosophy is a level of reasoning, where research takes place, above the smaller generalizations of science. It cannot be thought of as a basic method. It employs any creditable method or type of research possible in terms of the conditions of the project set up.

TABLE XX
EVALUATION OF A PHILOSOPHICAL RESEARCH REPORT ^a

Criteria	Scores	Comments
1	2	3
1. Reflective thinking	8.2	1. Actual processes of reasoning were carried through during eleven "procedures of education."
2. Generality of values	7.0	2. International attitudes were the data of research.
3. Economic and social worth	6.3	3. Changes in attitude toward other nations and toward war and disarmament are crucial.
4. Proper method	5.0	4. The experimental method was well adapted to the conditions of the studies made.
5. Definition of data	5.0	5. The meaning of the concepts investigated was implied, rather than stated definitely, although the many items of the tests used revealed their nature.
6. Measurement program . . .	4.8	6. The tests were as good as any available.
7. Classification of material . .	4.0	7. Statistical methods were adapted to the subjective data used.
8. Final report	3.7	8. This was well organized and excellently written.
9. Repetition of the study . . .	3.0	9. The detailed report makes actual repetition possible.
10. Further research	1.8	10. This is suggested in detail.
Total	48.8	
Possible total	50.0	

^a B. M. Cherrington, *Methods of Education in International Attitudes*. Contributions to Education. New York: Teachers College, Columbia University, 1934, No. 595.

All effective reflective thinking deals with large philosophical concepts in determination of the ultimate objective and in critical examination of conclusions for prognostic value. However, the pseudo-philosopher refuses to delay final decision and action for careful experimental evaluation of hypotheses appearing.

The value of research on this level may be determined in terms of criteria set up for descriptive, historical, or experimental investigation, if one or more of these basic methods of inquiry are used. There are also certain distinctive standards for philosophical studies themselves.

These include generality of values used, prognostic worth, selection of the right method, objective definition of data involved, adequate measurement programs, useful classification of material, and a good final report that makes provision for repetition and that gives definite suggestions for future research.

E. Research Exercises

1. Illustrate the difference between pseudo-philosophy and true philosophical thinking.

2. Is it possible to be at the same time a philosopher and a scientist? Illustrate.

3. Name four other American educational philosophers beside John Dewey and characterize the contributions of each.

4. Which of the twenty-four educators studied by J. F. Barnard⁴⁸ may be classed as scientists, which as philosophers, and which as both?

5. Illustrate the two steps in the thinking process where philosophical methods are used (Section A) by analyzing a research report in terms of the Dewey-Kelley procedures (Chapter I).

6. Illustrate the statement (Section A) that the philosopher-scientist is the reflective thinker of most economic and social value to mankind.

7. Analyze the administrative, supervisory, and teaching activities of a specific public school system and report in terms of (a) those based on adequate reflection, and (b) those based on the nonthinking attitudes of tradition, feeling, or indifference.

8. Analyze and evaluate by scoring the best report you can find of philosophical research that uses the descriptive method.

9. Analyze and evaluate by scoring the best report you can find of philosophical research that uses the historical method.

10. Analyze and evaluate by scoring the best report you can find of philosophical research that uses the experimental method.

⁴⁸ J. F. Barnard, *Great Educators We Should Know and Teach*. Greeley, Colo.: Unpublished Master of Arts Thesis, Colorado State Teachers College, 1933.

11. Analyze the philosophies underlying President F. D. Roosevelt's New Deal experiments.

12. Contrast the economic and social philosophies exemplified in Russian communism, German Naziism, Italian Fascism, and the American New Deal.

F. Additional Illustrations of Research for Philosophical Values

1. John P. Anderson, *Relationship Between Certain Aspects of Parental Behavior and Attitudes and the Behavior of Junior High School Pupils*, Contributions to Education. New York: Teachers College, Columbia, 1940, No. 809.

2. F. H. Bair, *The Social Understandings of the Superintendent of Schools*. Contributions to Education. New York: Teachers College, Columbia University, 1934, No. 625.

3. Edith W. Benjamin, *Application of the Principles of Appreciation to Mathematics*. Unpublished Master of Arts Thesis, University of Oregon, 1939.

4. I. C. Davis, "The Measurement of Scientific Attitudes," *Science Education*, 19: 117-122, 1935.

5. John Dollard, et al., *Frustration and Aggression*. Institute of Human Relations. New Haven: Yale University Press, 1939.

6. Mary D. Fite, "Aggressive Behavior in Young Children and Children's Attitudes Toward Aggression," *Genetic Psychology Monographs*, 22, No. 2: 151-391, 1940.

7. Hugh Hartshorne and M. A. May, *Studies in Deceit*. New York: The Macmillan Company, 1928.

8. P. B. Horton, "Student Interest in Church," *Religious Education*, 35: 219, 1940.

9. Marguerite W. Johnson, *Verbal Influences on Children's Behavior*, Monographs in Education. Ann Arbor, Mich.: University of Michigan, 1939, No. 1.

10. T. L. Kelley, *Talents and Tasks*. Cambridge: Harvard University Press, 1940.

11. Clara C. Linderholm, *The Social Implications of the Dominant Philosophies of Contemporary American Education*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1936.

12. Gildo Masso, *Education in Utopias*, Contributions to Education. New York: Teachers College, Columbia University, 1927, No. 257.

13. Josiah Morse and James Allen, Jr., "The Religion of One Hundred and Twenty-Six College Students," *Journal of Religious Psychology*, 6: 175-194, 1913.

14. Lois B. Murphy, *Social Behavior and Child Personality*. New York: Columbia University Press, 1937.

15. M. C. Otto, *The Human Enterprise: An Attempt to Relate Philosophy to Daily Life*. New York: F. S. Crofts and Company, 1940.

16. M. S. Ward, *Philosophies of Administration Current in the Deanship of the Liberal Arts College*, Contributions to Education. New York: Teachers College, Columbia University, 1934, No. 362.

17. G. B. Watson, *The Measurement of Fair-Mindedness*, Contributions to Education. New York: Teachers College, Columbia University, 1925, No. 176.

CHAPTER XI

The Prognostic Type of Research

IT WILL HAVE been recognized that no strictly logical classification of basic methods of research seems to be possible. Perhaps it is not necessary—or desirable (Chapter VII). The important problem for the neophyte appears to be a detailed understanding of the principal methods and techniques used by reputable scientists, so that he may make an intelligent choice in arranging the agendum of his own procedures in the research project he is undertaking.

If basic viewpoints are sought, one might say that (a) descriptive and (b) historical research differ chiefly in time placement, both seeking to result in clear interpretative exposition of situations investigated; and (c) experimental research seeks to control operating factors over an appreciable span of present and future time, so that informative checks of change and development may be reported.

A. Definition of Predictive Research

In like manner, it may be said that prognostic research aims to reveal the future operation of variables in either the natural science or the social realm. An objection may be made that this is the purpose of all true research, because scientific procedures are always in terms of the well-known steps of reflective thinking, and the last of these involves careful investigation of generalizations obtained in order to determine their probable permanence in time and place, their predictive value. This is, of course, true. However, for the discussion of this chapter, the name *prognostic research* will be given to any scientific investigation in which the main and stated purpose is to predict the future operation of factors investigated, so that inevitable things that must be done may be controlled more intelligently on the basis of knowledge about the analyzed trend of their occurrence over a definitely selected period of time.

It may be seen, then, that prediction may be based on any method

or type of research conceivable and desirable. The value of the prognosis will depend upon what background of authority is furnished for generalizations emerging through the use of methods and techniques selected. Perhaps, in ascending order, one would have here the category of description, historical trend, experimentation, and philosophy. Obviously, just a knowledge of the details of a situation, however complete, will not make possible an authoritative and far-reaching prediction. An analysis of series of related past events will be better. The historical trend often may tell what is best to do, even though it is said that "history never repeats itself." But better still is a longitudinal genetic study of factors in operation, over a continuation period long enough to establish the most probable nature and direction of their future occurrence. This is controlled experimentation. Prediction, after the carrying through of such a process of prolonged reflective thinking, should be most valuable of all. And, if the experimenter is at work in the realm of generalizations already of philosophical value, any prognosis possible will be most useful of all as a guide for human conduct. Reflective thinking, research, on this level should tell the individual and the group what to do about those all-important points of view that are basic in human relationships. We live in terms of our personal philosophies or those suggested to us from the social group.

The unthinking survey is obviously useless as an attempted basis for good prognosis. And, even when such a check is raised to the level of descriptive research, one cross-section status check, however thoughtful, cannot make the look ahead very valuable. For example, the Los Angeles school survey,¹ analyzed in Chapter VII, although unusual in the announcement of conclusions based upon principles and recommendations emerging from attempted reflective thought, did not foresee the later seismic calamities that suddenly produced a new situation with unique and strange problems.

James Bryce, in his illuminating comparative description of the status of modern democratic government, which, as a piece of descriptive research, he does not intend as a basis for prognosis, comments on the disabilities of historical research in attempted prediction of future events and movements.

So, too, in human affairs the thing that hath been is not, and the thing that is can never return, because its having existed is a new fact added to the chain of causation; and therefore those Eastern cosmologies which tried to help men to conceive of infinity by imagining a succession of cycles endlessly repeating themselves, were obliged to make each cycle end with a destruction

¹ O. R. Hull and W. S. Ford, *Survey of the Los Angeles City Schools*. Los Angeles City School District, 1934.

of all things in order that creation might start afresh, unaffected by what had gone before. That which the ancient poet said of the mind of man, that it changes with every returning sun, is true of nations also, whose thoughts and tempers vary from year to year, and true also of the institutions men create, which are no sooner called into being than they disclose unexpected defects, and begin to decay in one part while still growing in another.²

This is, of course, the "unique event" point of view; but Chapter VIII points out that the historian may and does think reflectively. After all, it may be the element of unrepeatability in attempted tracing of historical trends that makes the prognoses of the historian of lesser value, as a guide for the future.

The genetic element in controlled experimentation should bring with it greater possibilities of worth-while prediction. After reviewing all that is known about the operation of selected variables in an analysis of previous research, a prolonged examination of their action in a specific situation produces a trend of fact or of relationship that ought to furnish rather certain assumptions about their continuance into the future. For example, it is probable that the theory of dew announced by Sir John Herschel will not change. And the generalizations coming out of Louis Pasteur's work with microbes³ still rule the practices of modern surgery.

In the social science realm, experimentation may not be able to establish such permanence of trend. However, many controlled educational experiments have been able to look far ahead, in spite of the gloomy attitude taken by V. A. C. Henmon of the University of Wisconsin, refuted in part by W. S. Monroe⁴ of the University of Illinois. For example, in the many studies of the relative importance of native intelligence and environment in individual development, unanswerable evidence is accumulating for the prepotence of intelligence, although another school of thought still argues for the opposite view.⁵

² James Bryce, *Modern Democracies*. New York: The Macmillan Company, 1921, Vol. II, p. 597.

³ John Herschel, *Discourse on the Study of Natural Philosophy*, in J. S. Mill, *A System of Logic: Ratiocinative and Inductive; Being a Connected View of the Principles of Evidence and the Methods of Scientific Investigation*. New York: Harper & Brothers, 1873; René Vallery-Radot, *The Life of Pasteur*. New York: Doubleday, Doran and Company, 1923.

⁴ V. A. C. Henmon, "Measurement and Experimentation in Educational Methods," *Journal of Educational Research*, 18: 185-194, 1928; W. S. Monroe, "Controlled Experimentation as a Means of Evaluating Methods of Teaching," *Review of Educational Research*, 4: 36-42, 1934.

⁵ L. M. Terman, et al., *Nature and Nurture*. National Society for the Study of Education, 1928, Yearbook XXVII, Parts I and II; G. D. Stoddard, et al., *Intelligence: Its Nature and Nurture*. National Society for the Study of Education, 1940, Yearbook XXXIX, Part II; L. T. Hogben, "Nature and Nur-

But the most reliable basis for future prognosis should be found on the level of those inclusive points of view, those qualitative values and philosophies that are basic in all human activities. To change the figure, like that all-enveloping area of the stratosphere, they overlie all lower regions; and when social effort can be elevated to that altitude, its progress is relatively unimpeded and there is the most likelihood that some goal of worth-while truth, near to the *ultima Thule* of directed reflective thinking, may be reached. The last clause in the following sentence characterizes the data and the type of investigation that should be most fruitful here.

Whoever attempts to forecast the course systems of government will take must therefore begin from the two propositions that the only thing we know about the Future is that it will differ from the Past, and that the only data we have for conjecturing what the Future may possibly bring with it are drawn from observations of the Past, or, in other words, from that study of the tendencies of human nature which gives ground for expecting from men certain kinds of action in certain states of fact.⁶

This is the most difficult and at the same time the most valuable type of research (Chapter X). Its raw material consists of those generalizations, above the factual conclusions of science, which are intrinsically worth while in themselves and capable of verification and corroboration on higher and higher levels of value through experimentation controlled to any degree possible in such a complex and fluctuating situation. For example, whatever philosophies for social and economic life are confirmed by the present nation-wide experiments in economic and military dictatorship now in progress will be so potent in a determination of human welfare that they cannot be compared with the lesser investigations dealing with materials of lower generality. Here one finds the greatest possibilities for prognosis of supreme importance, because here all-controlling points of view constitute the data of research.

In addition to the ultimate philosophical value of the results of prognosis, the possibility of more *certain* prediction, as research travels up the levels of thinking data and method, is characterized by F. H. Allport and D. A. Hartman of Syracuse University in their analysis of the studies of F. S. Chapin of the University of Minnesota, and

ture," Chapter XXIII, *Science for the Citizen*. New York: Alfred A. Knopf, 1938; W. C. Bagley, *Determinism in Education: A Series of Papers on the Relative Influence of Inherited and Acquired Traits in Determining Intelligence, Achievement, and Character*. Baltimore: Warwick and York, 1925.

⁶James Bryce, *Modern Democracies*. New York: The Macmillan Company, 1921, Vol. II, p. 598.

A. L. Kroeber of the University of California of trends in invention and fashion.⁷

In S. A. Rice's Analysis 22, four methods of investigation—four ways of approaching experience—are considered. There are (1) the *stylistic* approach, (2) the *telic* approach, (3) the method of *genetic* explanation, and (4) the *natural science* approach. The thesis is that sure prognosis is seen to become more and more possible, that certainty in the prediction increases, as one examines successively these four research procedures.

In the *stylistic* method of research is found the lowest, the most informal level of reflective thinking; and in that fact lies the disability of certain prediction. The aesthetic qualities of the object or situation are determined. The result is emotional aesthetic satisfaction. This is based on whatever conformity is found with the student's own standards of form, proportion, and balance—with his basic point of view and ultimate objective in the study he is making.

In the investigation by A. L. Kroeber, already cited, the field of women's formal toilette was entered. Eight measurements of vertical and diameter distance were made over a period of seventy-five years (1844-1919). These were taken from fashion magazines. The raw data were converted to percentages of total height of figure. Year averages of these ratios were used to investigate tendencies and trends. He found, in particular in width of skirts, a rough cyclical curve of recurrence, "a swing of about sixty years in each direction; a period for the whole wave or cycle of 100 or 120 years, in this particular trait." From indications such as this, the author draws, it would seem, rather unwarrantable conclusions. He says that "the fact of regularity in social change is the primary inference from our phenomena." However, an analysis of his basic material shows that it was not chosen in terms of random sampling, but was rather narrowly selected. Further, he naïvely interprets concomitance as causation. For these reasons, one cannot accept his prognosis as reporting any high degree of certainty. This is characteristic of the *stylistic* approach. Valuable as it is in analysis of intrinsic qualities that yield worth-while personal aesthetic satisfaction, this method should not be employed when a quest for certainty is made into the future status of natural or social factors.

⁷ F. H. Allport and D. A. Hartman, "The Prediction of Cultural Change: A Problem Illustrated in Studies by F. Stuart Chapin and A. L. Kroeber," Analysis 22 in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, pp. 308-317; F. S. Chapin, *Cultural Change*. New York: D. Appleton-Century Company, 1928; A. L. Kroeber, "On the Principle of Order in Civilization as Exemplified by Changes of Fashion," *American Anthropologist*, 21: 235-263, 1919.

In the *telic* approach for an interpretation of experience is found some advance in the problem of prognosis. The investigator asks the questions, "What use can I make of this object? How will it satisfy my feeling of need?" As the characterizing word implies, there is a specific purpose, or end, in view. Generalizations are sought, so that they may be used in a practical way, in terms of their implications in human living. This leads to invention.

It will be seen that any possibility of prediction in this method lies in more or less good guesses about how a hypothesis or law will work. It is not concerned with confirming the validity of generalizations. For example, a number of years ago, when the inner combustion engine was produced, it might have been predicted that by 1941 people would have abandoned horse-drawn vehicles. But probably it would have been impossible to have said that everybody would be riding on rubber pneumatic wheels in metal and cushioned buggies. Prognosis could not have been as definite as that. It would have to have been simply in terms of fulfilling a rather vague need and purpose. To cite another illustration, ever since the time of Icarus and, later, Leonardo da Vinci,⁸ we have echoed the prediction that people would fly. But this wish-prognosis was blurred as to details and caused catastrophe to many a Darius Green until the time of the Wright brothers. Prediction here is perhaps somewhat more certain than in the realm of aesthetic values; but it always suffers from the disability of fitting itself to a future use, the practical details of which are not fully known.

An illustration of the *telic* method of approach may be found in the work of the test makers in the field of psychology and education.⁹

In the third method of approach, that of *genetic* explanation, the history of a phenomenon is traced. The result is a report of origin and whatever trend of development is found. It will be seen that here is greater possibility for worth-while prediction. But again the validity of generalizations is assumed, rather than investigated. It is their operation that is observed, and interpretation is always on the basis of how fully they satisfy points of view held by the investigator. Further, there are the disabilities arising from the uncertain assumption that conditions observed will continue into the future unchanged.

⁸ D. S. Merezhkovskii, *The Romance of Leonardo da Vinci*. New York: Random House, Inc., 1931.

⁹ P. M. Symonds, *Diagnosing Personality and Conduct*. New York: D. Appleton-Century Company, 1931; G. M. Ruch and G. D. Stoddard, *Tests and Measurements in High School Instruction*. Yonkers: World Book Company, 1927; L. M. Terman, *Terman Group Tests of Mental Ability*. Yonkers: World Book Company, 1926; Joseph Peterson, *Early Conceptions and Tests of Intelligence*. Yonkers: World Book Company, 1925.

If observation could be fundamentally scientific, prediction could be more certain; but this would be the next method of approach.

It will be seen that the genetic method includes the continuity study (Chapter VII) and historical research (Chapter VIII). It includes also the case study and the case-group and case-history methods. Illustrations already analyzed should be inspected in order to see how far they fit into this approach to an interpretation of experience.

Another type of genetic investigation, which uses highly mathematical techniques, is the correlation study.¹⁰ This device, when employed for prognosis, traces the relationship of measured variables over definite periods of time. Trends thus revealed are recorded in terms of the regression equation (Chapter XV). The regression coefficient for each factor expresses its value in the realm of concomitance investigated. Prediction is in terms of the amount of the dependent member of the equation, the criterion, when a summation of regression coefficients multiplied by the test scores of any individual is made.¹¹ For example, if (a) school success is the criterion it is desired to predict, the correlation of this dependent variable with (b) intelligence may be determined in the group of pupils now enrolled (r_{12}). This may turn out to be such that the regression coefficient in the generalized situation will be 75. Then, the regression equation might be:

$$\text{School success} = 75 \text{ Intelligence} + 40.$$

When the intelligence score of an applicant for admission is obtained, this may be substituted for the first member on the right side of the equation. Summation will yield the best prediction of his probable school success obtainable at the time of entrance.

C. C. Leinbaum,¹² when a graduate student at Colorado State College of Education, used this method for prediction of academic success in the teachers college. The regression equation reported the causal relationship of such variables as native intelligence, the mechanics of English, high-school marks, and freshman and sophomore college grades of a large group of individuals, as they did their class work during four secondary and two college years. The general trend of correlation was thus established, and the probable performance of any individual college student could then be calculated by equating

¹⁰ F. L. Whitney, *The Prediction of Teaching Success*. Journal of Educational Research Monograph. Bloomington, Ill.: Public School Publishing Company, 1924, No. 6.

¹¹ F. L. Whitney, *Statistics for Beginners in Education*. New York: D. Appleton-Century Company, 1929.

¹² C. C. Leinbaum, *Predicting College Marks*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1928.

his intelligence, class marks, and so on, in terms of the general value of these factors (regression coefficients) at each level.

An important group of researchers has used the device of partial and multiple correlation in an analysis of (a) the preparatory and (b) the teaching activities of public school teachers, in order to determine their relationship. Personality characteristics are included among independent variables also. Associated with these are related studies that have used other less accurate techniques.¹³ The ultimate objective is, of course, an accurate definition of teaching success, the criterion of all teacher-preparation activities. Many factors have been included in these studies. The majority of these are listed in Table XXI in terms of zero and higher order correlations with teaching success. The estimate of the educand is included also. This seems to correspond rather closely to adult ratings.

It is significant to note that *professional interest* is most clearly associated with teaching activity, and the teacher's *personality traits*, *professional test scores*, *psychology course marks*, *salary*, and *student teaching success* follow in rank order. Telescoping these characterizing words, it appears that there is some evidence that interest in teaching, personality traits, and knowledge of child mind lead to success in the classroom and that this is associated with salary increase.

Obviously, these predictive studies have not as yet answered the question, "What is a successful teacher?" But they have made some progress. For example, the closeness of agreement in rank order of independent variables between one of the earlier researches and another ten years later is significant. Table XXII gives the relative weights of the six and eight factors studied in the two dissertations.

It is seen that the rank order of preparatory emphasis, physical status, and abstract intelligence are found to be identical, but that when home background is determined it proves to be second in importance only to student-teaching opportunities. It is surprising that social intelligence is not found

¹³ J. E. Bathurst, "Do Teachers Improve with Experience?" *Personnel Journal*, 7: 54-57, 1928; C. W. Boardman, *Professional Tests as Measures of Teaching Efficiency in High School*. Contributions to Education. New York: Teachers College, Columbia University, 1928, No. 327; C. M. Frasier, "Intelligence as a Factor in Determining Student Teaching Success," *Educational Administration and Supervision*, 15: 623-629, 1929; A. R. Mead and C. E. Holley, "Forecasting Success in Practice Teaching," *Journal of Educational Psychology*, 7: 496-497, 1916; W. H. Pyle, "The Relation Between Intelligence and Teaching Success," *Educational Administration and Supervision*, 14: 257-267, 1928; C. W. Waddell, "Prognostic Value of Certain Factors Related to Teaching Success in Practice Teaching," *Educational Administration and Supervision*, 13: 577-592, 1927; A. S. Barr, et al., "The Prediction of Teaching Efficiency," *Journal of Experimental Education*, 15: 1-100, 1946.

TABLE XXI
RANK ORDER OF THIRTY-EIGHT FACTORS RELATED TO TEACHING
SUCCESS, 1906-1937 ^a

Rank	Variable	Modal coefficient
1	2	3
1	Pupil estimates of teachers .....	.78
2	Professional interest .....	.70
3	Personality .....	.54
4	Trait index .....	.46
5	Professional test .....	.38
6	Psychology courses .....	.37
7	Salary .....	.35
8	Student teaching rating .....	.33
9	Teaching interest .....	.30
10	Academic courses .....	.28
11	Methods courses .....	.26
12	College of education courses .....	.25
13	History of education .....	.24
14	Native intelligence .....	.21
15 to 38	Extracurriculum, methods test, dominance-ascendance, socio-economic status, study habits, sympathy, Weber secondary education test, social intelligence, occupational interests, self-rating, life age, physique, high school courses completed, teaching experience, interest outside teaching, self-sufficiency, handwriting, family, habitat, total adjustment, neuroticism, prejudice, no teaching plans, class cuts .....	.20 to -.53

^a J. L. Meriam, *Normal School Education and Efficiency in Teaching*. Contributions to Education. New York: Teachers College, Columbia University, 1906, No. 1; F. B. Knight, *Qualities Related to Success in Teaching*. Contributions to Education. New York: Teachers College, Columbia University, 1922, No. 120; G. T. Somers, *Pedagogical Prognosis*. Contributions to Education. New York: Teachers College, Columbia University, 1923, No. 140; F. L. Whitney, *The Prediction of Teaching Success*. Journal of Educational Research Monographs. Bloomington, Ill.: Public School Publishing Company, 1924, No. 6; C. W. Boardman, *Professional Tests as Measures of Teaching Efficiency in High School*. Contributions to Education. New York: Teachers College, Columbia University, 1928, No. 327; Elizabeth H. Morris, *Personal Traits and Success in Teaching*. Contributions to Education. New York: Teachers College, Columbia University, 1929, No. 342; R. R. Ullman, *The Prognostic Value of Certain Factors Related to Teaching Success*. Ashland, Ohio: A. L. Garber Company, 1931; H. L. Kriner, *Pre-Training Factors Predictive of Teacher Success*. Pennsylvania State Studies in Education. State College, Pa.: School of Education, Pennsylvania State College, 1931, No. 1; W. S. Phillips, *An Analysis of Certain Characteristics of Active and Prospective Teachers*. Contributions to Education. Nashville, Tenn.: George Peabody College for Teach-

TABLE XXII

RANK ORDER OF PERSONAL AND PREPARATORY VARIABLES RELATED
TO TEACHING SUCCESS, 1921-1931

Rank	F. L. Whitney, 1921 ^a	Rank	R. R. Ullman, 1931 ^b
1	2	3	4
1	Student teaching.	1	Student teaching.
2	Academic class marks.	2	Socio-economic status.
3	Professional class marks.	3	Academic class marks.
4	Physique.	4	Professional class marks.
5	High-school record.	5	Social intelligence.
6	Abstract intelligence.	6	Physique.
		7	High-school record.
		8	Abstract intelligence.

^a F. L. Whitney, *The Prediction of Teaching Success*. Journal of Education Research Monograph. Bloomington, Ill.: Public School Publishing Company, 1924, No. 6.

^b R. R. Ullman, *The Prognostic Value of Certain Factors Related to Teaching Success*. Ashland, Ohio: A. L. Garber Company, 1931.

higher in the list, and possibly one may conclude that the test for social intelligence used was not valid, as teaching is surely a social act.

These data are seen to be of wider significance because of the fact that in the earlier study a population of 1,200 elementary school teachers, graduates of two-year normal courses, was used; while in the 1931 investigation the subjects were about 120 high school teachers who had had four years of preparation in a state university.¹⁴

Finally, the so-called *natural science* approach offers the highest degree of certainty for prognosis. It arises from a possibility of explicit denotation in objective phenomena studied. They do not have to be perceived implicitly, subjectively, as on lower levels of investigation of experience. They can be manipulated and measured. Then analysis reduces the material used to simpler components, generalizations appear, and laws may be tentatively announced. It was found in Chapter IX that the most successful method of analysis and interpretation is that of controlled experimentation.

ers, 1935, No. 161; A. L. Odenweller, *Predicting the Quality of Teaching: The Predictive Value of Certain Traits for Effectiveness in Teaching* Contributions to Education. New York: Teachers College, Columbia University, 1936, No. 676; Peter Sandiford, M. A. Cameron, C. B. Conway, and J. A. Long, *Forecasting Teaching Ability*. Toronto: Department of Educational Research, University of Toronto, 1937, Bulletin No. 8.

¹⁴ F. L. Whitney, "What Preparation Determines Teaching Success?" Editorial, *Teachers Journal and Abstract*, 6: 312, 1931.

It is seen that on this level of reflective thinking the intrinsic general value of phenomena is considered. There is not simply a discovery of trend, as in the genetic approach; a fitting of conditions to purpose, as in the telic method; or a personal evaluation of aesthetic qualities, as in stylistic activity. More or less permanent laws are deduced, in whatever realm of natural or human activity the student is at work. The degree of their permanence (generality) is a measure of the certainty of predictions that may be made. There is not ultimate certainty, even with this method of approach. There is probability only that, under similar conditions, specific events will happen in the future. It is these natural and social laws that we live by, motivated and guided by adopted attitudes and philosophies.

It will be seen that the natural science approach involves the method of reflective thinking, the essential element in science and creditable research, according to the thesis of this book. Many illustrations have been given in preceding chapters on the work of such natural scientists as Pasteur and Lister and such social students as Macaulay, Thorndike, and Terman.

One more example of the natural science approach, of reflective thinking in the field of human relationships, may be cited. This is the group of experiments made by F. H. Allport¹⁵ of Syracuse University on the influence of the social group on mental work. Two small controlled groups of subjects were used, many factors, such as fatigue and boredom, being held constant, so that the experimental variables *alone* and *together* might operate undisturbed. The rotation method was employed, in which these experimental variables were alternated. An attempt was made to hold rivalry constant, but this was not very successful. The work consisted at different times in uniting free-choice associations, and in abstract reasoning exercises. Tentative conclusions reached included: (a) higher speed of association was correlated with working in a group, but more personal associations were produced when alone; and (b) in the production of ideas by the thinking process, more were written in group work, but there were more superior ideas when the subjects worked alone. The findings of these studies are highly significant for the reorganization of public education, but further research should deal with larger samplings of the population, so that laws of social psychology emerging may be more worth while for prognosis.

This section characterizes prognostic research. It includes any type of scientific work in which the main purpose involves Kelley's sixth step in the process of reflective thinking, an appraisal of the "new

¹⁵ F. H. Allport, "The Influence of the Group upon Association and Thought," *Journal of Experimental Psychology*, 3: 159-182, 1920.

solution in the light of future needs,"¹⁰ Prediction is most certain when based on generalizations obtained through a process of true reflective thinking. It is most valuable when announced in terms of philosophical attitudes and points of view.

B. Techniques of Prediction

The crowning act of reflective thinking is the final step, when generalizations obtained are examined critically for permanence value (Chapter I). This is prognosis. However, the term *prognostic research* is restricted in this chapter to those more or less formal attempts to foresee and foretell future events. This is prophecy, prediction. There are a number of different ways in which data are handled in the prognostic type of research. These have to do with the various techniques used in abstracting worth-while generalizations from the situation under investigation. They do not consider basic meanings of certainty and value, as discovered in the previous section. They deal with differences on a lower but important level in methods of classification of material for the purpose of revealing true future meanings. A number of these types of technique may be illustrated.

By the use of *graphic representation*, very clear, understandable pictures of trends of fact are reported. The data involved are nearly always derived from tabular measurements. Usually the summation figures or those descriptive of important groups of facts are selected from the total complex of the table (Chapter XV). But the expression of these trends in terms of surfaces of frequency, or in some other form of graph, tends to make discussion clearer and interpretation easier and more worth while.

A young superintendent of schools was asked by his board of education to make an estimate of population increase in a small Western town. He found the figures for school census, enrollment, and attendance for the past eleven years and drew them on a two-way graph with population and years on the axes. Then, he extended each smoothed line in its general direction over the next few years (Figure 3). This was a prediction based upon trends of very concrete, objective facts. The interpretation accompanying the report to the board was, "It will be seen that our present seating capacity, which provides for but our present enrollment of 1,300 children, must be increased in the near future, if pupils are not to be handled on half time." However, the uncertainty of such objective prognosis as this is shown by the fact that in this school district school population actually in-

¹⁰ T. L. Kelley, *Scientific Method: Its Function in Research and in Education*. New York: The Macmillan Company, 1932.

creased much faster than the lines on the graph indicated, because of the unexpected coming of a large packing plant with its working families.

A second technique used for prediction is that of adequate *description* for the discovery of trends, with the assumption that some degree of permanence may be the basis for certainty. In the field of the past, historical research makes contributions for present practice in this

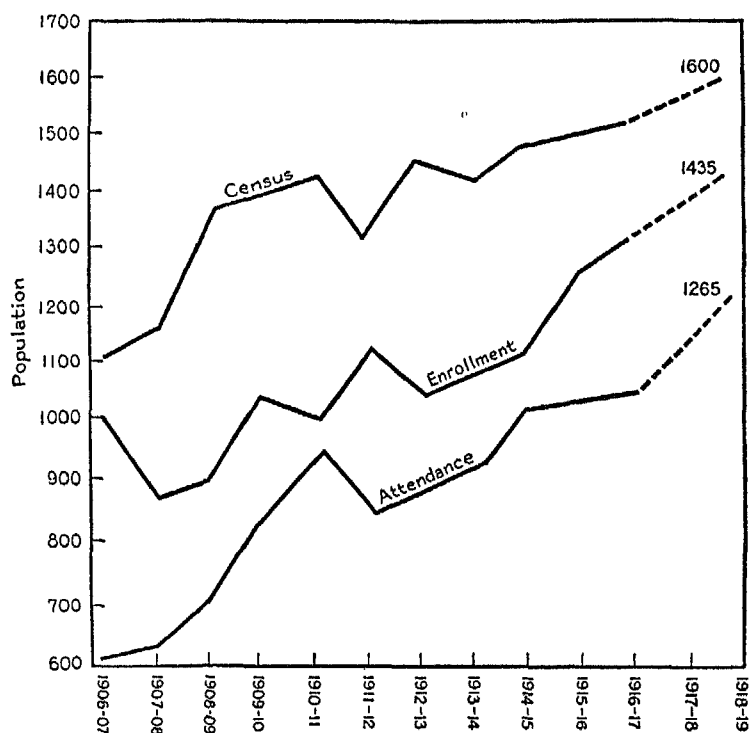


Figure 3. TREND OF SCHOOL CENSUS, ENROLLMENT, AND ATTENDANCE IN THE HURON, SOUTH DAKOTA, SCHOOL DISTRICT, 1916-1917, AND PREDICTION TO 1918-1919.*

manner. Knowledge of the experience of the race ought to be of value in telling the present generation what to do about the pressing social problems of the present. For example, if modern governments would study the past experience of other national groups from the time of the Greek attempt at pure democracy, it may be that more intelligent

* F. L. Whitney, *Report of the Superintendent of Schools, 1916-1917*. Huron, South Dakota: Board of Education, 1917, p. 25.

plans in the fields of socio-economics and national control would be made. There is perhaps some hope for a more objective study of trends in Vilfredo Pareto's¹⁷ residues and derivations (Chapter II). If these are actually measurable expressions of amount for the motivating forces that underlie collective human action, trends in social codes, religion, politics, and business may be plotted in an understandable manner. A knowledge of the action of these underlying feelings will be more fundamental and more useful for prediction than detailed accounts of the overt acts of peoples or administrators.

Among the many illustrations that may be cited of teaching by prediction from a historical trend is that of Karl Marx during the early part of the last century. Investigating by long, painstaking research the substitution for the social and economic conditions of the Middle Ages of a new order characterized by the rise of private capitalism, he stated specifically that it was "the ultimate aim of this work to lay bare the economic laws of motion of modern society"; that is, to establish a trend. This succession of events with assumed cause and effect relationships pointed, he thought, to an eventual substitution for capitalism of some form of communism. This prediction was embodied in the *Communist Manifesto* of 1848 and has been repeatedly employed in many Internationals. In detail, Karl Marx's prognosis reads as follows:

Along with the constantly diminishing number of the magnates of capital who appropriate and monopolize all the advantages of this process of transformation occurs the mass of misery, oppression, slavery, degradation, and exploitation. But with this too, grows the revolt of the working class, a class always increasing in numbers and disciplined unity, organized by the very mechanism of the process of capitalistic production itself. The monopoly of capital becomes a fetter upon the mode of production which has sprung up and flourished along with and under it. Centralization of the means of production and socialization of labor at last reach a point where they become incompatible with other factors within the capitalist integument. This integument is torn asunder. The knell of capitalized private property sounds. The expropriators are expropriated.¹⁸

The fact that the prophecy of Karl Marx has not come true does not concern this discussion. It is a good illustration of prediction from a historical trend. It may be pointed out that in the country in which

¹⁷ J. A. Blanqui, *Histoire de l'Économie Politique en Europe, depuis les Anciens jusqu'à Nos Jours*. 1838; Paris: Guillaumin, Vols. I, II; Vilfredo Pareto, *The Mind and Society*. New York: Harcourt, Brace and Company, 1934.

¹⁸ Karl Marx, *Capital: A Critical Analysis of Capitalist Production*. London: Swan Sonnenschein and Company, 1902, p. xix.

Karl Marx found his principal data, the English crisis of 1848, 1857, 1873, and the others were alleviated without the aid of a communistic social element. Further,

... when communistic revolution finally enveloped one of the nations of Europe, it found the fertile soil for the experiment in the least highly capitalized of the major European nations. If the intensification of capitalism was to bring about the doom of capitalism, the communist revolution should logically have occurred in the United States or England, Holland or Belgium. Yet these highly capitalized nations are the very ones in which communism is still a subject of interesting discussion rather than a prospect of imminent fulfillment. And the cause is not far to seek. The development of capitalism has been incompatible with despotic authoritarianism. One after another of the monarchical nations took on the forms of a freer political life after becoming adjusted to the freer enterprise of capitalism in the economic sphere.¹⁹

A statement of this opposite view, with objective proof of the potency of "Capital Savings" in the development of modern society, was made by Carl Snyder, prominent statistician and economist. His generalization is as follows: "That thesis is that there is one way, and only one way, that any people, in all history, have ever risen from barbarism and poverty to affluence and culture; and that is by that concentrated and highly organized system of production and exchange which we call Capitalistic: one way, and one alone."²⁰

A third technique for prognosis is that of the tracing of a trend for concomitance or *relationship* between factors as they operate over a time period of statistical observation. This is the technique of partial and multiple correlation, illustrated in a number of the studies of teaching success analyzed in Section A. One more investigation may be cited in order, particularly, to note what degree of certainty in prognosis was attained.

S. A. Courtis, in his doctor's dissertation at the University of Michigan, set up a series of experiments with the purpose of predicting the school success of public school pupils. He gave his objective as follows:

The other phase is the philosophic purpose of utilizing the resulting knowledge to interpret the scientific study of educational problems, particularly the use of measurement in educational investigations, in such a way that both its value and its dangers may be clearly seen. The research student in any field has frequent need to maintain his perspective, to weigh values and appraise

¹⁹ A. D. H. Kaplan, *What, If Not Capitalism?* Denver, Colo.: University of Denver, 1935, Bulletin 36, No. 17, p. 13.

²⁰ Carl Snyder, *Capitalism the Creator; The Economic Foundations of Modern Industrial Society*. New York: The Macmillan Company, 1940, p. 4.

proportions. A little knowledge is always a dangerous thing and especially during periods of rapid development is there need for frequent periods of self-orientation. Here the goal is the formation of a program of future work, a map of the road to be followed: its twistings and turnings, its difficulties, its ultimate destination.

A statement of the organization of the final report gives a listing of experimental procedures followed:

It begins with an historical summary of the movements which have contributed to the present point of view, a statement of tendencies in the development of theory. Next, an explanation of the factor concept is given, and a summary of definitions of essential terms. Both of these discussions are present-day products of past development of theory.

The discussion then turns from the theoretical aspects to the details of the actual measurements made, and the conditions under which they were made. The first fruit of these measurements, however, was evidence which justified the pursuit of the general aim in a narrow field. That justification is given in some detail.

So far all has been introduction and preparation. With the ground thus cleared and the problem rendered specific and definite, two chapters follow dealing in narrow and intensive terms with the measurement of the four major factors, performance, heredity, maturity, and training in the specific experimental fields selected for study.

Finally, there is a return to the general problem and the conclusions from the specific studies are utilized in making the larger generalizations which form the real goal of the study as a whole.

The experimental programs traced the development of heredity, maturity, training, and ability, and made predictions for certainty in generalizations found. But relatively small, carefully controlled groups of subjects were not used in this investigation. All of the children in three Detroit public schools were included. The groups represented in the measurement programs carried through numbered from 324 to 2,800 individuals in each. However, rather close correspondence between obtained predictions and actual future scores was reported. An average error of only 8 per cent was found. Illustrative of the technique is the regression equation for prediction of handwriting achievement:

$$\text{Handwriting} = .51 \text{ Age} + .289 \text{ Intelligence} + .208 \text{ Motor} \\ \text{ability} - 30.3$$

The general conclusion from the measurement prognosis and the tracing of relationships for prediction is that:

Children succeed in school work in general in accordance with their development or maturity. The level of their development at any age level is

fixed by hereditary factors which are measured roughly by the intelligence tests, while the training contributes a small but distinctive amount in addition. These factors account for 90 per cent of the changes in children. Other factors, such as home influence, health, etc., cause variations in individuals, but on the average all such factors combined do not displace the average child more than 10 per cent from his predicted place.²¹

Other types of techniques employed for prediction might be cited. Their study and analysis is highly important. The success of research in the field of prognosis is dependent, not alone on the intelligent selection and skillful use of basic methods of reflective thinking, but on a wide and detailed knowledge of available tools and techniques. The certainty and value of predictions made can never rise above the validity and reliability of devices employed.

C. Evaluation of Predictive Types of Research

In a decision on standards of value for a prognostic investigation, there is, as in all methods and types of research, the basic inquiry which asks, How closely does this study conform to the processes and procedures of reflective thinking? Does the inquiry have its origin in an actual area of human need? Is the problem carefully conceived in terms of adequate definition? Is it worth while? Is it feasible now, considering inevitable ability, time, and money costs? First of all, is a reasonable hypothesis for the solution of the problem tentatively accepted? Is the program for the collection of evidence on the value of the guessed solution adequate? Is the conclusion carefully corroborated deductively? And, most important of all for this type of research, is there detailed provision in techniques used for formal prediction, as the ultimate purpose of the investigation?

Outside of these criteria, pertinent to all creditable research, there are a number of considerations applicable especially to prognosis. Perhaps most important of all is *certainty* in prediction. Of course, this is the basic inquiry in all reflective thinking, as John Dewey has shown.²² But it would seem to be the *sine qua non* in prognosis. If the look ahead is vague and limited, it is not prophecy in any useful sense. The previous section has pointed out that the criterion of certainty may best be attained through the so-called natural science ap-

²¹ S. A. Courtis, *Why Children Succeed: A Study of the Factors Conditioning the Progress of Children in School, and of the Problems That Must Be Solved Before the Relationships Between the Factors and School Success Can Be Reliably Determined*. Doctor of Philosophy Dissertation, University of Michigan, 1925, p. 194.

²² John Dewey, *The Quest for Certainty: A Study of the Relation of Knowledge and Action*. New York: Minton, Balch and Company, 1929.

proach to experience, and that the prediction becomes more and more uncertain, and finally useless, as one employs the genetic, the telic, and the stylistic methods.

Perhaps of equal importance in prognosis is the criterion of *value*. This has to do with the locus of the research and the intrinsic worth of data dealt with. As already suggested, the values involved in any reflective thinking increase as one travels up the scale of generality in the science-philosophy process. On the lower levels of reflection is found material of lesser value, because of restricted application. In the upper regions of thinking, research deals with data of wider and wider significance. The implications for human living are inclusive, of more general interest. It is when the raw material of reasoning, leading toward prediction, consists of qualitative philosophical entities that conclusions for the future are most important. Then suggestions for human conduct will have the greatest value, because they will affect those basic tendencies and motives that guide individual and group living. Knowledge and action should then be on a high level of efficiency.

A third criterion for prediction is care in the selection of just the right basic *method* of research. Shall prognosis be attempted from description of a situation in present or past time? Or shall it have as background the careful analysis of a trend of maturation, development, or achievement in controlled situations? The answer is as already given many times. Suggestions for future human activity may be and are derived more or less naïvely from the more inadequate background of types of reflective thinking of lesser value. But greatest certainty is insured when controlled experiments are set up and the direction of present trends of fact or relationship is determined, in order that the line of influence may be followed into the future in terms of worthwhile prediction.

But even when a basically good method of research is employed, the certainty of prediction may be lessened by the careless or ignorant selection of inadequate *techniques*. For example, in a correlation study, coefficients of zero order only may be obtained, thus violating the law of the single variable. Or arrays of factors may be so short that the rougher, less valuable rank-order expressions of relationship have to be deduced. Or the wrong type of setup for experimentation may be decided upon. The hazards of research are countless, when problems of technique are considered. Of course, most serious of all is the basic disability from which all investigation in the field of the social sciences suffers. It is a comparatively new area for ordered reflective thinking. Expressions of amount, tools for measurement,

and all problems of method and technique are in a more or less pioneer and unsettled condition. However, this should stimulate the student of the problems of human relationship to greater effort, so that his work may soon rise above the level of careless acceptance of unproven generalization to more certain and more valuable prognosis.

In addition to these standards, there are obviously the important criteria for all creditable research discussed in preceding chapters. They have to do with such considerations as adequate definition and limitation of a worth-while *problem*, careful *definition* and *control* of variables, an adequate and skillfully administered *measurement* program, good *classification* of data obtained in order to make possible adequate discussion and enhance the value of interpretation, a *final report* in readable form and in sufficient detail so that a critical *repetition* of the research project is made possible, and finally definite provision for *further research* by way of careful listing of related problems that the next investigator should attack.

TABLE XXIII
A SCORE CARD FOR PROGNOSTIC RESEARCH

Criteria	Scales		
	Low	Medium	High
1	2	3	4
1. Certainty	4.0	6.0	8.3
2. Value	3.7	5.0	7.2
3. Method	3.5	5.0	6.5
4. Techniques	3.0	4.0	5.9
5. Definition of variables	2.5	3.5	5.5
6. Control of variables	2.0	3.5	5.0
7. Measurement program	1.7	2.8	4.5
8. Classification of data	1.5	2.5	4.1
9. Final report	1.0	2.0	3.5
10. Repetition	1.0	1.5	2.8
11. Further research	0.5	1.0	1.7
Perfect score (total)	55.0		

These eleven criteria are put in score-card form in Table XXIII. It may be that there are other standard items that should be added. It is suggested that student groups study the rubrics of the scale and revise them if they think it necessary; then rescale them, as illustrated in Chapter VII. Here also it may be just as effective to use the fully completed score cards for descriptive, historical, and experimental research given in Chapters VII, VIII, and IX. In correlation studies,

TABLE XXIV
EVALUATION OF A PROGNOSTIC RESEARCH REPORT ^a

Criteria	Scores	Discussion
1	2	3
1. Certainty	8.0	1. The regression equation technique made possible rather accurate prediction.
2. Value	7.2	2. The data dealt with were highly significant to pupil development through the grades and secondary school.
3. Method	6.5	3. The method of prediction by means of the technique of partial and multiple correlation and the regression equation is applicable to the problem attacked.
4. Techniques	5.9	4. Statistical treatment of data was masterly.
5. Definition of variables...	5.0	5. The details of the tests used reveal the character of factors involved in the study.
6. Control of variables....	5.0	6. This was by accepted mathematical techniques.
7. Measurement program ..	4.0	7. This was in terms of class marks and test scores more or less objective.
8. Classification of data ...	4.1	8. Accepted techniques were used.
9. Final report	3.0	9. The report was well organized and on the whole excellently written. See below.
10. Repetition	2.0	10. More detailed and clearer exposition in certain places would have made a trend of research more possible.
11. Further research	1.0	11. General suggestions were given on the desirability of more research in the field of guidance.
Total	51.7	
Possible total	55.0	

^a T. L. Kelley, *Educational Guidance: An Experimental Study in the Analysis and Prediction of Ability of High School Pupils*. Contributions to Education, New York: Teachers College, Columbia University, 1914, No. 71.

Table XII may be used; in researches like that of Karl Marx,²³ Table

²³ Karl Marx, *Capital: A Critical Analysis of Capitalist Production*. London: Swan Sonnenschein and Company, 1902, p. xix.

XIV; and in controlled experiments, Table XVII. In Table XXIV is found a student evaluation of a specific report of prognostic research. Criticize the discussion in Column 3.

D. Summary

The prognostic type of research may be defined as reflective thinking in the use of any basic method of investigation, when the main purpose is to predict future events.

Prediction is most certain when the best method of ordered reflection is employed, that of controlled experimentation. In a fourfold category for investigating and explaining experience, the lowest probability of certainty is the stylistic approach. The likelihood of certainty increases as one considers the telic approach, genetic explanation, and the so-called natural science method.

Techniques useful in setting up research studies for prediction include graphic representation, description for the tracing of trends of fact, correlation for the determination of the facts of concomitance or relationship, and the like.

Prognostic research may be evaluated in terms of general but basic criteria for all creditable reflective thinking. It may be scored also in terms of certainty, value, method of research used, and techniques employed. Standards applicable to all scientific research should be considered as well. Among these are a worth-while problem definitely limited, adequate control of all variables, a well-conceived testing program, acceptable classification of data for discussion and good interpretation, a readable and detailed final report capable of critical repetition, and provision for further research among related unsolved problems.

E. Research Exercises

1. Set up in agendum form a study to predict the research success of master of arts students.
2. Define teaching success in terms of the data in Table XXI. Discuss the inadequacy of the definition.
3. (a) Organize plans for a piece of predictive research employing the stylistic method of approach. (b) The telic method. (c) The genetic method. (d) The natural science method.
4. (a) Make agenda for prognoses based on descriptive research. (b) On historical research. (c) On experimental research. (d) On the philosophical type of research.
5. Analyze a predictive research report in terms of the Dewey-Kelley steps in reflective thinking.

6. Cite and analyze critically the most certain prognosis in the field of economics that you can find.²⁴

7. Cite and analyze critically the most valuable prognosis in the field of philosophy that you can find.

8. Illustrate how graphic representation of predictions aids skillful discussion and adequate interpretation.

F. Additional Illustrations of Prognosis

1. A. S. Barr, "The Validity of Certain Instruments Employed in the Measurement of Teaching Ability," in Helen M. Walker, editor, *The Measurement of Teaching Efficiency*. New York: The Macmillan Company, 1935, pp. 73-141.

2. J. B. Bury, *The Idea of Progress*. New York: The Macmillan Company, 1920.

3. J. E. Chadwick, *The Prediction of Success in Music*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

4. R. D. Collman and Cecil Jorgensen, *The Prediction of Scholastic Success*. Educational Research Series No. 35. Melbourne, Australia: Australian Council for Educational Research, Melbourne University Press, 1935.

5. P. M. Condit, "The Prediction of Scholastic Success by Means of Classification Examinations," *Journal of Educational Research*, 19: 331-335, 1929.

6. W. F. Dearborn, *The Relative Standing of Pupils in the High School and in the University*. High School Series. Madison, Wis.: University of Wisconsin, 1909, No. 6, Bulletin No. 312.

7. J. W. Dunlap, "The Predictive Value of Interest Test Items for Achievement in Various School Subjects," *Journal of Applied Psychology*, 19: 53-58, 1935.

8. J. R. Emens, R. C. Maul, and T. M. Stinnett, "The 1947 Study of Supply and Demand for Teachers," *North Central Association Quarterly*, 22: 248-259, 1947.

9. R. M. Hughes, "Higher Education in 1980," *Journal of Higher Education*, 9: 77 ff, 1938.

10. H. L. Moore, *Forecasting the Yield and the Price of Cotton*. New York: The Macmillan Company, 1917.

11. C. W. Odell, *Predicting the Scholastic Success of College Students*, Bureau of Educational Research. Chicago: University of Illinois, 1930, Bulletin No. 52.

12. J. R. Riggleman and I. N. Frisbee, "Business Forecasting," Chapter XVII in *Business Statistics*. New York: McGraw-Hill Company, 1938.

²⁴ Carl Snyder, *Capitalism the Creator; The Economic Foundations of Modern Industrial Society*. New York: The Macmillan Company, 1940, Chap. II, pp. 31-46.

13. H. B. Sullivan, *A New Means of Appraising the Qualifications of Prospective Teachers*. Doctor's Dissertation, Cambridge, Mass., Harvard University, 1944.
14. E. L. Thorndike, *et al.*, *Prediction of Vocational Success*. New York: The Commonwealth Fund, 1934.
15. H. A. Toops, *Trade Tests in Education*. Contributions to Education. New York: Teachers College, Columbia University, 1931, No. 115.

CHAPTER XII

Sociological Types of Research

IN ALL TYPES of approach to an understanding of human experience by the method of reflective thinking, that which takes account of group life is of supreme importance in the solution of crucial problems. This has to do with the relationship of man to his fellows, of group to group, and of human institutions to societal welfare, with the reaction of people to environment, and with all problems of development except those dealing with the individual alone.

A. Definition of the Sociological Type of Research

Since the time of Auguste Comte, increasingly effective efforts have been made to study group life objectively. Social science, interested in all reflective thinking outside the realm of the natural sciences, has appeared. Sociological research recognizes need for reflection in specific cases of human conflict and arrested development among groups. It conceives of hypothetical solutions for those most crucial and feasible for solution. It investigates these ordered guesses as objectively as possible, and announces generalizations to be tried out deductively. Recommended installation of new methods or modified institutions are then observed experimentally, and tentative conclusions reached.

The realm of sociological research includes all human relationships, but the most crucial problems of societal welfare are very probably found in the institutions organized for education. Educational sociological research, because of the possibility of its contribution to the solution of problems inherent in group life, is the most important field for investigation. Applied sociology may well increasingly emphasize the public school and all projects for education as a most fruitful field for reflective thinking.

Research in educational sociology, then, seeks to solve the problems of education as an institution for human betterment. On the one hand, it investigates the results of educational efforts in group life, the

changes effected in society. On the other, it seeks to determine the relationship of all types of human activities and institutions to organized educational efforts. It operates in terms of reflective thinking on the objectives, the content, and the method of education as related to society in its past, present, and future status. "It seeks to explain how education as a social process may under optimum conditions eliminate social defects, perpetuate desirable institutions, group activities, group forms and practices, and attain for society the ideals and standards it aims to achieve."¹

B. The Field of Sociological Research

From one point of view, the area of inquiry in which sociological research operates may be thought of as that of social investigation in general, as found in the bipartite classification of all approach to an explanation of experience: (a) natural science and (b) social science. A more analytical conception is the organization used by the American Sociological Society in their census of social research, as published annually in the *American Journal of Sociology*.

- a. Human Nature and Personality.
- b. Peoples and Cultural Groups.
- c. The Family.
- d. Social Organization and Social Institution.
- e. Population and Territorial Groups.
 - (1) Demography and Population
 - (2) Ecology.
- f. The Rural Community.
- g. Collective Behavior.
 - (1) The Newspaper.
 - (2) Recreation, Celebrations, Festivals.
- h. Conflict and Accommodation Groups.
 - (1) Sociology of Religion.
 - (2) Educational Sociology.
 - (3) Courts and Legislation.
 - (4) Social Change and Social Evolution.
- i. Social Problems, Social Pathology, and Social Adjustments.
 - (1) Poverty and Dependency.
 - (2) Crime and Delinquency.
 - (3) Health.
 - (4) Mental Disease.
 - (5) Hygiene.
- j. Theory and Methods.
 - (1) Case Studies.
 - (2) Sociological Theory and History.

¹ E. G. Payne, *Principles of Educational Sociology: An Outline*. New York: New York University Press, 1928, p. 29.

Here are found the social institutions: the family, the press, the church, the school, the courts, and the legislature. Areas of cooperation and conflict appear; problems of population, of group personality, of pathology and antisocial behavior. In fact, the entire gamut of human relations is included in the total of problems attacked by sociological research.

C. Types of Sociological Research

In its widest significance, sociological research may seek to answer in detail three questions: (a) What are the trends in the development of society, and what generalizations appear for the improvement of all human institutions? (b) In group life in general, what factors and forces are directly related to efficiency in that most important institution, the school? (c) What segments and procedures of the educational enterprise are most directly related to society?² Of course, other social institutions, such as the home, the church, and government, might be included in this list of questions. However, among the total of the following illustrations, these group enterprises will be found to appear in many instances in their relationship to organized educational efforts. They all have educational objectives in the sense that they aim to make group living possible on higher levels of human happiness.³

It is difficult to discover reports of research studies that have no relationship whatever to or implications for education. All human experience changes personality and group attitudes. But education by means of organized efforts in the school may be considered as a separate and most important social institution. Then certain investigations may be pointed out that have a (a) *general sociological* point of view, at least as far as not dealing directly with educational implications alone.

Perhaps the most minutely valuable research reports of sociological community status is found in *Middletown*, an analysis of the small Midwestern city of Muncie, Indiana, of about 30,000 inhabitants. Here a survey staff of five workers lived for about a year and a half, making objective checks of six types of activities: getting a living; making a home; training the young; using leisure in various forms of play, art, and so on; engaging in religious practice; and taking part in community activities. The purpose of the research was "to present a dynamic, functional (life-activity) study of the contemporary life of a specific American community in the light of the trends of changing

² E. G. Payne, "Research Problems and Trends in Educational Sociology," *Journal of Educational Research*, 25: 239-252, 1932.

³ E. S. Bogardus, "Experimental Research in Sociology," *Sociology and Social Research*, 33: 33-40, 1948.

behavior observable in it during the last thirty-five years." Instead of continuous historical checks, two cross-sections were taken, representing conditions in 1890 and in 1924. The methods and techniques of the study consisted of personal participation in the local life, examination of documentary material, compilation of statistics, interviews, questionnaires, and similar activities. After seven years, another check of cultural status was made. These two studies picture a total community trend of nearly fifty years.⁴

Such case studies as that of Pauline V. Young,⁵ in which the interaction between the past experiences of two cultural groups is described, should be cited. But it is obvious that the life activities of both the Russian peasants and the citizens of the American city where they were located impinged at many points on school efforts and problems. In examining P. G. Cressey's⁶ analysis of commercial recreation, a similar possibility of direct implications for organized education is discovered.

Perhaps an example of so-called "pure" research is found in the account that M. H. Ross⁷ gives of the effects of the introduction, boom, and decline of coal mining in the Blue Ridge Mountains of Kentucky. This is a report of the trend of social forces in a change from agrarian stability to industrial collapse. The folkways of the primitive mountaineer are described, and how he became a miner. In particular, his present misery is emphasized, now that his land is gone and his labor is not needed.

This is an excellent illustration of descriptive research in the field of social relations. The social worker recognizes and defines a serious problem. He is conscious of a hypothetical solution. In his conclusions, he suggests remedial measures, the return of surface rights, reforestation, water power projects, development of local handicrafts, a tax on coal for rehabilitation and for research for permanent remedies.

Another illustration of general sociological research is found in E. W. Bakke's⁸ study of the effect of the dole on English labor. As a fellow

⁴ R. S. Lynd and Helen M. Lynd, *Middletown: A Study in Contemporary American Culture*. New York: Harcourt, Brace and Company, 1929, and *Middletown in Transition: A Study of Cultural Conflicts*. New York: Harcourt, Brace and Company, 1937.

⁵ Pauline V. Young, *The Pilgrims of Russian-Town*. Chicago: University of Chicago Press, 1932.

⁶ P. G. Cressey, *The Taxi-Dance Hall: A Sociological Study in Commercialized Recreation and City Life*. Chicago: University of Chicago Press, 1932.

⁷ M. H. Ross, *Machine Age in the Hills*. New York: The Macmillan Company, 1933.

⁸ E. W. Bakke, *The Unemployed Man*. New York: E. P. Dutton and Company, 1934.

of Yale University, this research student investigated the problem, "What has been the effect of unemployment insurance on the willingness and the ability of English workers to support themselves?"

This, again, is an example of descriptive research. The actual conditions of living in many London boroughs are analyzed and reported, and the attitudes of the workers described. To make the report complete, comparative techniques should have been employed, using such reports as that of Marion Elderton, *Case Studies in Unemployment*.⁹ The meaning of the attitudes of the unemployed in relation to problems of respect for law, class conflicts, making a livelihood, the home, leisure, religion, politics, education, and other institutions might have been interpreted. The final generalization appearing is favorable to the dole, as administered in England, as a wise social and scientific measure.

The point of view and the specific research interests of the general sociologist may be determined by a check of reports found in a publication like the *American Journal of Sociology*. One such analysis appeared in 1932.¹⁰ Groups of problems treated in this thirty-five-year period included those dealing with family; culture, conflict, and territorial groups; the social process; pathology; personality traits; and the like. Another report¹¹ of the content of the same journal covers a total of nearly 2,000 projects in a six-year period and consists of an analysis of the census of the annual reports of research studies made by members of the American Sociological Society (See Section B).

Factors in social life (b) *related to organized educational efforts* have been studied by many workers in sociological research. An illustration is found in Ruth S. Cavan's recent check, among groups of Chicago boys and girls of about 1,000 each, of the relationship between home background and social contacts on the one hand and personality adjustment on the other. Check scales and questionnaires were the tools used for getting information. Much of the report is given to a discussion of the validity and the reliability of these techniques. The White House Conference Personality Scale¹² was used,

⁹ Marion Elderton, *Case Studies in Unemployment*. Philadelphia: Wharton School of Finance, University of Pennsylvania, 1931, Research Studies No. 12.

¹⁰ Howard Becker, "Space Apportioned Forty-Eight Topics in the *American Journal of Sociology*, 1895-1930," *American Journal of Sociology*, 38: 71-78, 1932.

¹¹ H. G. Duncan and Winnie L. Duncan, "Research Interests in Sociology," *Sociology and Social Research*, 19: 442-446, 1935.

¹² Ruth S. Cavan, "The Relationship of Home Background and Social Relations to Personality Adjustment," *The American Journal of Sociology*, 40: 143-154, 1934; and "The Murray Psychoneurotic Inventory and the White House Conference Inventory," *Journal of Juvenile Research*, 18: 23-27, 1934.

as a neurotic inventory, to select good, fair, and poor adjustment. It was found that these scores correlated fairly well with favorable to unfavorable items of both home conditions and social relationships.

The report closes at this point. No attempt is made to connect the facts revealed with the school. But one might assume that, if home and social life could produce educands well adjusted to group life, education could begin its work at a higher level and could be more completely successful with the final product, a democratic citizenry. This is an example of significant survey, but the opportunity to raise it to the level of descriptive research by adequate interpretation of generalizations found is not embraced.

A group of studies in the field of eugenics, with implications for public school education, has been conducted by Paul Popenoe for the Human Betterment Foundation of Pasadena, California. The problem of size of family, as related to the depression and dependency, was investigated among a group of 504 homes in Los Angeles County. The average family was found to have five living children, one third born after the family went on the relief rolls. Further, the typical Mexican family is half again as large. Dependent wives are still young.

Present methods of administering charitable relief, it appears, are encouraging, and paying for, the reproduction of a class of persons many of whom are eugenically inferior.

From any point of view, it would seem to be only common sense that every new family admitted to charitable relief should also be given contraceptive instruction and material, unless it is clear that no children are likely to be produced while the family is dependent. Beyond this, sterilization at public expense should be provided for selected patients who desire it.¹³

The status of public health, as related to public education, includes many problems significant to public welfare. These have to do with longevity, normal diet, stimulants and narcotics, cost of living, accidents, insurance, and similar topics. The most important group of studies in this field was carried on by E. G. Payne¹⁴ and his students at New York University. They began with a survey of the community served by Public School No. 106 in Manhattan to determine the facts of health practices, as related to possible remedial education.

Studies of environment in specific natural areas, human communities, reveal informative data about sociological backgrounds of great

¹³ Paul Popenoe and Ellen M. Williams, "Fecundity of Families Dependent on Public Charity," *American Journal of Sociology*, 40: 214-220, 1934.

¹⁴ E. G. Payne and J. C. Gebhart, *Method and Measurement of Health Education*. New York: Association for Improving the Condition of the Poor, 1926.

value in the formulation of educational programs. These are investigations of human ecology, such as those of Nels Anderson, W. C. Reckless, Louis Wirth, H. W. Zorbaugh, and others. One of the most significant of these is that completed by F. M. Thrasher in 1926.¹⁵ In addition to analyzing the distribution of Chicago gangland, the report deals with development, organization, leadership, and activities. The gangs were found in three distinctly marked city areas:

The first of these we may call the "North Side jungles"; the second, the "West Side wilderness"; and the third, the "South Side badlands"—names which well characterize the regions so far as gang life is concerned. Gangland stretches in a broad semicircular zone about the central business district (the Loop) and in general forms a sort of *interstitial* barrier between the Loop and the better residential areas.

The evidential data presented in this study, in addition to a carefully made map of the gangs and cultural areas of the city, consisted of 272 original human documents, interviews, and personal accounts, reproduced in part or in entirety. This study was pioneer in the field. Further, the semipopular form of the report has attracted wide attention to the city slum problem.

A second study of social background headed by F. M. Thrasher¹⁶ was begun in 1928, with the financial aid of the Bureau of Social Hygiene of New York City. This is the Boys' Club study of New York University. The primary purpose of this group of researches was to investigate the slogan of the Boys' Clubs of America, "Character building for citizenship." More specifically, it was an inquiry into the validity of the main argument advanced in justification of boys' club work, that it prevents juvenile delinquency and crime. The procedures consisted of checks of the ecology of boyhood in the selected area, individual case studies, and statistical distributions basic for point and spread reports, correlations, and the determination of causers.

Many analyses of social institutions as related to public education

¹⁵ R. D. McKenzie, "The Scope of Human Ecology," *Journal of Applied Sociology*, 10: 316-323, 1926; Nels Anderson, *The Hobo: The Sociology of the Homeless Man*. Chicago: University of Chicago Press, 1923; W. C. Reckless, *Vice Areas in Chicago*. Chicago: University of Chicago Press, 1933; Louis Wirth, *The Ghetto*. Chicago: University of Chicago Press, 1928; H. W. Zorbaugh, *Gold Coast and Slum: A Sociological Study of Chicago's Near North Side*. Chicago: University of Chicago Press, 1929; F. M. Thrasher, *The Gang: A Study of 1,313 Gangs in Chicago*. Chicago: University of Chicago Press, 1927, pp. 6, 7.

¹⁶ F. M. Thrasher, R. L. Whitley, Janet F. Nelson, I. V. Sollins, and Zola Braunstein, "The Boys' Club Study," *Journal of Educational Sociology*, 6: 1-64, 1932.

have been made. One of the most recent of these to appear in complete form is the series of twelve reports¹⁷ on the influence of motion pictures on childhood and youth conducted by the Committee on Educational Research of the Payne Fund. These studies cover a period of four years under the general direction of W. W. Charters of Ohio State University. The content of this group of reports is indicated by their titles. They deal with social attitudes and conduct; the origin of ideas, emotions, and standards of morality; the effect on sleep; relationship to delinquency and crime; and similar problems.

One of the most significant of these studies, that of C. C. Peters, deals with the relation of the movies to social mores. This attempts to measure, as objectively as possible, existing differences, negative or positive, between approved standards of public morals and typical social situations represented in movie programs. Four phases of morals are dealt with: love making, kissing, democratic practices, and the treatment of children by parents. Approval and disapproval were measured in many type groups and in the case of over 200 pictures.

Many other illustrations of studies of the relation of society to education might be given. W. B. Nathan reported the facts of mortality in Harlem with problems of education appearing. C. E. Holley investigated the question: What social factors determine the number of years of schooling received by public school pupils? E. H. Sanguinet surveyed the status of Filipino homes. Henry Harap¹⁸ analyzed the facts of consumption in American life in order to throw light on de-

¹⁷ Herbert Blumer, *Movies and Conduct*; Herbert Blumer and P. M. Hauser, *Movies, Delinquency, and Crime*; P. G. Cressey and F. M. Thrasher, *Boys, Movies, and City Streets*; Edgar Dale, *Children's Attendance at Motion Pictures, How to Appreciate Motion Pictures, and The Content of Motion Pictures*; W. S. Dysinger and C. A. Ruckmick, *The Emotional Responses of Children to the Motion Picture Situation*; P. W. Holaday and G. D. Stoddard, *Getting Ideas from the Movies*; V. L. Miller and Dorothy Marquis, *Children's Sleep*; C. C. Peters, *Motion Pictures and Standards of Morality*; Ruth C. Peterson and L. L. Thurstone, *Motion Pictures and the Social Attitudes of Children*; F. K. Shuttleworth and M. A. May, *The Social Conduct and Attitudes of Movie Fans*; W. W. Charters, *Motion Pictures and Youth: A Summary*. New York: The Macmillan Company, 1933.

¹⁸ W. B. Nathan, *A Study of Health Conditions in Harlem, New York, Based on a Full Five Years Mortality Record, with Implications for Health Education*. Doctor's Dissertation, New York University, 1930; C. E. Holley, *The Relationship Between Persistence in School and Home Conditions*. Chicago: National Society for the Study of Education, 1916 Yearbook XV, Part II; E. H. Sanguinet, "Adaptation of the Schools to the Social Order in the Philippine Islands," *Journal of Educational Sociology*, 8: 421-427, 1935; Henry Harap, *The Education of the Consumer: A Study in Curriculum Material*. New York: The Macmillan Company, 1924.

sirable objectives and specific content for education. Many others of equal significance might be cited.

One of the most careful recent analyses of the social situation as related to education is found in the report of the Department of Superintendence, National Education Association, committee, which reported in 1934¹⁰ on current socio-economic trends and their implications for a new education. On the one hand, a statement was made with regard to standards of living, control of government, nationalism and internationalism, social institutions, and social reconstruction. On the other, educational relationships were discussed under fourteen heads: a new education in social and economic understanding, a new education in government, education for broad national cultures and for international cooperation, the curriculum and a realistic education of socially useful work, need for new outlets for released creative energies, the school curriculum and the achievement of desired social changes, new demands on professional-education institutions, devising a new method of learning, the probable increased growth of school population, the demands of new conditions on differentiation of curriculums, a great increase in educational support, equal educational opportunity for all, a new teacher-education program, and a powerful educational association working for social reconstruction.

There is a third group of studies in the field of educational sociology dealing with (c) the *school* itself, as having *direct implication* for the *welfare of society*. Of course, from one point of view, every factor in organized education, every philosophy and activity must affect the group life of the community, as the educand is at the same time a member of the larger society. It is said that the school is life, that there is no possibility of separate preparation for living. There is learning by personal doing in the everyday activities of childhood, adolescence, and the adult, as well as cumulative interlearning²⁰ from the experience of others.

However, certain factors within the school as it exists are found on the periphery of its organization as an institution, nearer to the areas occupied by other social units. These have direct sociological bearing and effect, and may be grouped in a rough fourfold organization. There is the relationship of education to community groups and to

¹⁰ Harold Rugg, *et al.*, "Our Socio-Economic Situations and the New Education," *Journal of Educational Sociology*, 7: 532-544, 1934.

²⁰ Gustav Spiller, *The Origin and Nature of Man: An Inquiry into Fundamentals, Reconciling Man's Proud Achievements with Man's Humble Descent*. London: Williams and Norgate, 1931; "The Place of Interlearning in Education," *Journal of Educational Sociology*, 9: 4-14, 1935; C. A. Ellwood, "The Fundamental Research in Educational Sociology," *Journal of Educational Sociology*, 8: 4-11, 1934.

the various social institutions. There are evaluations of educational institutions, as well as more or less objective measurements of the social results of education.

(1) *Education and community groups.* A distinctly social point of view in curriculum-making for education is found in the report of the Committee on Curriculum-Making of the National Society for the Study of Education.²¹ In the "composite statement" of generalizations resulting from the committee's work, education is conceived of as taking place in a social situation. Specifically, sections of the conclusions announced deal with such topics as "Curriculum-construction in the light of both study of child growth and effective social life," "Curriculum-making and the scientific study of society," "The school as a conscious agency for social improvement," and "The curriculum and social integration." In this report, one finds evidence that educators are thinking socially in their effort to arrange educational activities effectively.

A specific illustration of proposals for the application of this social philosophy to the rural community is found in a statement by D. H. Kulp.²² Here the twenty-four problems listed include "Sociological aspects of school support," "Social worlds of rural children," "Comparison of spontaneous school groups with non-school leisure groups of the community," "Shortages of facilities for group activities," "Teacher education for rural sociological work," and the like, all assuming that education is a social problem.

An investigation of the feasibility of a socially organized project curriculum, based on the traditional "cardinal principles," in Public School No. 80, Brooklyn, has been made by J. J. Loftus.²³ After analyses of existing objectives, classroom and large-school activities, and teachers' plan-book devices, evidences of social cooperation were discovered among teachers, children, and community groups, such as the chamber of commerce. The conclusion is that the public elementary school may be organized effectively as a sociological project for community improvement.

Other examples of social community planning by public school units include those reported by Superintendent H. A. Wann²⁴ of Madi-

²¹ Harold Rugg, *et al.*, "The Foundations of Curriculum-Making," Chapter I in *The Foundations and Technique of Curriculum-Construction*. Chicago: National Society for the Study of Education, 1926, Yearbook XXVI, Part II.

²² D. H. Kulp, "Problems of Rural Education Demanding Sociological Research," *Teachers College Record*, 31: 332-338, 1930.

²³ J. J. Loftus, *A Practical Revision of an Elementary School Curriculum*. Doctor's Dissertation, New York University, 1927.

²⁴ H. A. Wann, "Social Planning in a Community," *Journal of Educational Sociology*, 9: 494-508, 1936.

son, New Jersey, and Leonard Covello, Principal of the Benjamin Franklin High School, New York City.²⁵ In Madison, social planning began in 1928 with a youth survey by the Boys' Work Committee of the local Rotary Club. This resulted in the formation of a Social Planning Council for research and the introduction of projects. Subcommittees representing various natural-interest groups were the Community Calendar Committee, the Public Health Council, the Recreation Committee, the Religious Education Committee, the Film Committee, the Guidance Committee, and the Committee on Out-of-School and Out-of-Work Youth. In the Benjamin Franklin High School, located in the East Harlem region, the problem of the foreign-born youth is dealt with. A Community Advisory Council works in terms of five committees for better citizenship. These are the committees on health, citizenship, parent education, correction and guidance, and race.

In addition to such school-community projects as these, adult education has recently expanded and received greater attention, especially in the urban situation. Outstanding examples of this include the community forum movement initiated in Des Moines, Iowa, by United States Commissioner of Education, J. W. Studebaker,²⁶ when superintendent of schools there. These group meetings for discussion of community problems are appearing in many large cities and smaller centers. Another adult education project, long in operation on a level of high efficiency, is the Denver Opportunity School.²⁷ Here the community problem of the man and the woman on relief is attacked in terms of the use of unoccupied time for leisure occupation, as well as for specific preparation for work whenever it is available.

(2) *Education and social institutions.* The relation of education to such institutions as the home, marriage, sex, the church, and the nation has been investigated by many educators and educational sociologists. For example, such studies as those of Katherine B. Davis, R. G. Foster, and E. R. Groves²⁸ deal with problems of sex and the family.

²⁵ Leonard Covello, "A High School and Its Immigrant Community—A Challenge and an Opportunity," *Journal of Educational Sociology*, 9: 331-346, 1936.

²⁶ J. W. Studebaker, *American Way: Democracy at Work in the Des Moines Forums*. New York: McGraw-Hill Book Company, 1935; "What I Mean by Public Forums," *School Life*, 21: 23, 1935; and "Education for Democracy," *School and Society*, 43: 305-311, 1936.

²⁷ F. H. Swift and J. W. Studebaker, *What is This Opportunity School? A Study of the Denver Tax-Supported Institution of That Name*. New York: American Association for Adult Education, 1932; A. W. Gill, *A Survey of the Opportunity School of Denver*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930.

²⁸ Katherine B. Davis, *The Sex Life of Twenty-Two Hundred Women*. New

The first report showed a distinct relationship between sex education and success and happiness in marriage. R. G. Foster's study of marriage adjustments grew out of the work of the Advisory Service for College Women at the Merrill-Palmer School in Detroit, Michigan. About fifty intensive case studies were undertaken among college graduates at various stages of the marriage experience, from the pre-marital point to the care of children. Continuous intensive contacts were supplemented by physical and other records.

The results of such a study as this should afford educators, social workers, ministers, physicians, home economists, and students of the family certain types of information useful in clinical and technological fields. It should give some insight into the circumstances surrounding the initial years of marriage as a basis for understanding the types of situations related to family adjustment. One should also be able to obtain more accurately firsthand information as to the origin of certain patterns or types of family relationship that develop and the cultural factors, both past and present, that seem to be significant in this regard.

The statement of E. R. Groves gives a proper philosophy for guidance in educational projects for family improvement.

The family cannot be institutionalized any more than it can be supplanted. The inability of the family to imitate the school must not cover up the value of the home as an educational agency either in the earliest years of childhood or throughout the period. Meanwhile, any tendency to allow the family to look to the schools to give it a parasitic relief from responsibility needs to be resisted. Instead, the peculiar function of the family in the program of education should be respected not only by parents but by those who have the making and the administering of our school policy.

A contribution to the whole problem of the development of international attitudes is found in the work of the Service Bureau for Education in Human Relations among fifteen schools in New York City in 1934-1935.²⁹ The teachers and the investigator agreed upon definite working theses, which were the hypotheses and objectives of their experiment. They included the propositions that the development of more sympathetic attitudes toward other peoples is an obligation in American education and that no one race is better than any other race. Learning activities were organized in terms of intellectual approach resulting in more pertinent knowledge, emotional approach for

York: Harper & Brothers, 1929; R. G. Foster, "A Study of Early Marriage Adjustments," *Journal of Educational Sociology*, 9: 119-123, 1935; E. R. Groves, "The Bearing of the Sociology of the Family Upon Educational Theory," *Journal of Educational Sociology*, 9: 34-39, 1935.

²⁹ Rachel Davis-DuBois, "Developing Sympathetic Attitudes Toward Peoples," *Journal of Educational Sociology*, 9: 386-396, 1936.

the development of proper feeling toward foreigners, and situational approach for the practice in meeting various culture groups. Results were gratifying, but were not reported completely and adequately.

Many studies of the various forms nationalism is taking might be cited. From James Bryce's classic analysis of democracy to very recent more or less impressionistic accounts of the status of communism and Fascism in its various manifestations, these reports should be found in the social science curriculum of open-minded public school centers. The national experiment in Russia is characterized in a preceding chapter. A popular comparative account of the economic and social national projects in Italy and Germany has appeared. The editor of the *British Labor Monthly* has analyzed the principles and practices of Fascism in all countries where it has come to power. Books on the Mexican situation are many. Several rather objective studies of attitudes toward foreigners might be cited. These include the Connellsville experiment in international-mindedness and a Colorado master's report. In the case of high-school seniors, negative attitudes may be based on ignorance, although one may not assume that complete acquaintance with the foreigner will result in liking.³⁰

(3) *Evaluation of educational institutions.* C. A. Ellwood pleads for social education in terms of interlearning;³¹ and research in educational sociology may well proceed, in evaluation of educational institutions, with this criterion for the development of social imagination and sympathy. But this is a difficult goal, even far beyond the conception of most present-day educators. Other lesser values are most often considered in published checks of the success of specific public school units.

The so-called school survey movement,³² discussed in Chapter VII,

³⁰ James Bryce, *Modern Democracies*. New York: The Macmillan Company, 1927; M. T. Florinsky, *Fascism and National Socialism*. New York: The Macmillan Company, 1936; R. P. Dutt, *Fascism and Social Revolution*. New York: International Publishers, 1934; Stuart Chase, *Mexico: A Study of Two Americas*. New York: The Macmillan Company, 1931; D. W. Campbell and G. F. Stover, "Teaching International-Mindedness in the Social Studies," *Journal of Educational Sociology*, 7: 244-248, 1933; Nellie E. Cole, *The Personal Attitudes of High School Pupils in Colorado Towards Alien Nations and Peoples*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1932; E. R. Wood, "High School Seniors' Familiarity with the World Today," *Journal of Educational Sociology*, 6: 556-563, 1933; W. L. Shirer, *Berlin Diary: The Journal of a Foreign Correspondent*. New York: A. A. Knopf, 1941.

³¹ C. A. Ellwood, "The Fundamental Research in Educational Sociology," *Journal of Educational Sociology*, 8: 4-11, 1934.

³² J. B. Sears, *The School Survey: A Textbook on the Use of School Surveying in the Administration of Public Schools*. Boston: Houghton Mifflin Company, 1925.

has been and is, on the whole, an illustration of the analysis of public school efforts, each a distinct group situation, without adequate consideration of social values present. Too often, funds and energy are expended first of all in determination of the status of the individual educand, as related to achievement goals set up by adult curriculum groups. All the complexity of data usually reported would be of great value for adequate evaluation if it could be interpreted in terms of social objectives attained through the process of interlearning.

An excellent point of view, as well as suggested details of attack, for effective study of that social institution, the organized public school, is found in an important book by Willard Waller⁸³ of Pennsylvania State College. Descriptive research material to be obtained and adequately interpreted in terms of social values should consist of such items as the faculty as citizens of the community, and parent-teacher relationship, as well as all personnel influences, pupil groups, teacher-pupil relations, teacher personality, and all those social factors and social phenomena present in the world of the school.

One important report on a city public school, approaching these desirable standards of social procedure and technique, is that of G. S. Counts.⁸⁴ It deals with the Chicago situation. The lack of effective public school organization is pointed out in the failure to take intelligent account of actual social forces in operation. A historical trend of ignorance and inattention is found, and its effect on public school offerings analyzed. This masterly indictment should be suggestive for effective administrative reorganization in large-city school systems.

The trend in that basic segment of the educational enterprise, the preparation of teachers, is traced and evaluated in such studies as that of E. R. Mosher and the Missouri normal school survey. Here the historical development of the teacher-education institution is traced from its beginning in Massachusetts to the modern status of a collegiate state educational unit. A typical situation is found in the Missouri institutions in 1915, and their professional development reported ten years later. It was discouraging to note that in 1926 only four of the fifteen proposals of the survey commission had been met. Recommendations, based upon these discovered trends, for a reorganization of the teacher-education situation were made in Hawaii, where the Territorial Normal and Training School became later the School of Education of the University of Hawaii.⁸⁵

⁸³ Willard Waller, *The Sociology of Teaching*. New York: John Wiley and Sons, 1932.

⁸⁴ G. S. Counts, *Schools and Society in Chicago*. New York: Harcourt, Brace and Company, 1928.

⁸⁵ E. R. Mosher, *The Rise and Organization of State Teachers Colleges*. Un-

More intimate evaluations of work of individual teacher-education institutions may be represented by the study³⁶ of the progress of the entering class of 1927 at Colorado State College of Education through their four years of academic experience. In this case, trends in general intelligence and in scholarship were traced, and continuous improvement in the group was attributed to wise selection of student personnel and higher levels of student achievement. The relationship between intelligence and scholarship was found to be positive, but not close. Evidently, there are other determiners of scholastic success present outside of native intelligence. These are being discovered and applied in student guidance. They are found in the realm of feeling, character traits, attitudes, and the like.³⁷ As a result of studies such as this, extending over a period of seven years, Colorado State College of Education initiated in 1931 a comprehensive guidance program for all students, under the management of a director of personnel. About the same time, entrance requirements were changed in terms of desirable personality on the part of the prospective teacher, instead of the presentation of selected credits in specified high-school subjects.³⁸

Evaluation of public education in the university may be illustrated in the point of view of such outstanding educational statesmen as the late L. D. Coffman of the University of Minnesota, genetic studies like that of F. S. Chapin, and critical self-surveys, such as that recently

published Doctor's Dissertation, Harvard University, 1923; W. S. Learned, W. C. Bagley, *et al*, *The Professional Preparation of Teachers for American Public Schools: A Study Based Upon an Examination of Tax-Supported Normal Schools in the State of Missouri*. New York: Carnegie Foundation for the Advancement of Teaching, 1920, Bulletin No. 14; C. M. Hill, *A Decade of Progress in Teacher Training*. Contributions to Education. New York: Teachers College, Columbia University, 1927, No. 233; F. L. Whitney, "The Teachers College in a State System," *Kekumukula*, July 13 and 22, Honolulu, Hawaii, 1928.

³⁶ F. L. Whitney and John Milholland, "A Four-Year Continuation Study of a Teachers-College Class," *Journal of Educational Research*, 27: 193-199, 1933; P. F. Ottens, *A Four-Year Continuation Study of the Class of 1931 of Colorado State Teachers College*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

³⁷ J. D. Heilman, *The 1936 Report on the Cooperative Testing Programs of The Teachers-College Personnel Association*. Greeley, Colo.: Personnel Department, Colorado State College of Education, 1940.

³⁸ G. W. Frasier, "College Entrance: A New Plan," *School Executives Magazine*, 49: 73-75, 1929, and "Selective Admission of Students: Its Philosophy," *Journal of the National Education Association*, 20: 341-342, 1931; R. L. Stinnette, *An Evaluation of the Present College Entrance Requirements at Colorado State Teachers College*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930.

completed at the University of Chicago.³⁹ F. S. Chapin traces historical changes in a typical state institution for higher education, the University of Minnesota. Cycles of growth for student groups are reported in terms of changes in organization status at different periods. Tensions and imbalances are analyzed. The point of view is that this study of the extracurriculum constitutes a significant evaluation of the total work of the university. The University of Chicago studies covered all items of institutional endeavor, trends in growth, organization and administration, instruction, admission of students, the alumni, the library, the plant, and similar factors, as indicated in the list of the twelve publications resulting.

(4) *Measurement of the results of education.* The so-called testing movement, originating a generation ago, is indicative of an increasingly objective attitude toward public education and its product. However, there is found much to be desired in reports made even today, when adequately social criteria are considered. The theory of individual differences, important in itself, has too frequently centered attention on personal development alone, disregarding group problems in the school world and outside.

An excellent illustration of a more critically social attitude is found in an experimental measurement of health education in Public School No. 106, New York City.

The technique consisted in selecting an experimental and a control group, in contriving a scale of health practices, and rating, with the aid of trained social workers who observed the children in their homes, the children's health habits; in teaching a model health curriculum to the experimental group; and in then re-rating both control and experimental groups against the scale. While this procedure lacks the objectivity and precision of the achievement test, it yields far more significant data—a knowledge of how far instruction has carried over into social behavior.⁴⁰

Examples of the measurement of the results of public education in state systems and in small units may be cited. These evaluations have set up criteria of excellence, resembling the index numbers of

³⁹ F. S. Chapin, "Research Studies of Extracurricular Activities and Their Significance in Reflecting Social Changes," *Journal of Educational Sociology*, 4: 491-498, 1931; and *Cultural Change*. New York: D. Appleton-Century Company, 1928; L. D. Coffman, "Obligation of Universities to the Social Order," *School and Society*, 36: 641-647, 1932; F. W. Reeves, *University of Chicago Survey*. Chicago: University of Chicago Press, 1933, Vols. I-XII.

⁴⁰ H. W. Zorbaugh, "Research in Educational Sociology," *Journal of Educational Sociology*, 1: 23-24, 1927. Compare E. G. Payne and J. C. Gebhart, *Method and Measurement of Health Education*. New York: Association for Improving the Condition of the Poor, 1926.

economics inquiries, descriptive of the present status of many significant variables.

Measurement of American state educational systems began in 1912 with a report by the Division of Education of the Russell Sage Foundation. In 1920, L. P. Ayres published a more analytical study. In 1925, F. M. Phillips, on the basis of new data for each state, suggested the following thirteen criteria for the objective measurement of the efforts of a state public school system.⁴¹

CRITERIA FOR THE RANKING OF STATE PUBLIC SCHOOL SYSTEMS

(a) Percentage of school population in average daily attendance; (b) average number of days attended by each child of school age; (c) average number of days schools were in session; (d) per cent high school enrollment is of total enrollment; (e) per cent boys were of girls in the high school; (f) average expenditure for each child attending; (g) expenditure per child of school age; (h) average expenditure per teacher employed; (i) average expenditure per pupil for expenses other than salaries; (j) expenditure per teacher for salaries; (k) illiteracy; (l) per cent of high school graduates continuing their education; (m) ratio of teacher-training students to teaching positions.

Two similar lists of criteria for application to county school systems have recently been published.⁴² These have to do with measures of *performance* and of *ability*.

MEASURES OF PERFORMANCE

(a) Illiteracy; (b) average daily attendance and school census; (c) membership in grades nine to twelve; (d) length of school term; (e) expenditures for salaries; (f) salaries and total current expenditures; (g) average annual salary; (h) holding power for boys; (i) resistance to the depression; (j) teacher preparation; (k) teacher tenure; (l) size of school; (m) expenditures for transportation; (n) buildings and equipment; (o) school indebtedness.

MEASURES OF ABILITY

(a) Assessed valuation; (b) ratio of children to adults; (c) density of population; (d) spendable money; (e) white and Negro population.

Index numbers for the evaluation of the work of a city school system were suggested by G. W. Frasier in 1922.⁴³

⁴¹ Russell Sage Foundation, *A Comparative Study of Public Schools in Forty-Eight States*. New York: Russell Sage Foundation, 1912, Pamphlet No. 124; L. P. Ayres, *An Index Number for State School Systems*. New York: Russell Sage Foundation, 1920; F. M. Phillips, "Educational Rank of States, 1930," *American School Board Journal*, 84: 25-29; 37-39; 29-30; 39-40, 1930.

⁴² L. M. Chamberlain, *Measures of Educational Performance in the County School Districts of Kentucky*. Lexington, Ky.: Bureau of School Service, University of Kentucky, 1934, Bulletin No. 4.

⁴³ G. W. Frasier, *The Control of City School Finances*. Milwaukee: Bruce Publishing Company, 1922.

CRITERIA FOR CITY SCHOOL SYSTEMS

(a) The percentage of sixteen- and seventeen-year-old children in school; (b) the percentage of elementary school classes smaller than forty pupils; (c) the percentage of children having adequate playground space; (d) the percentage of well-trained teachers; (e) the percentage of "increased cost of living from 1913-14 to 1919-20 that was met by increased salaries for elementary women teachers."

Perhaps the outstanding investigation of the status and value of a state public school system is that under the directorship of L. H. Gulick of Columbia University. This report of the Regents' Inquiry into the Character and Cost of Public Education includes a total of fourteen studies. See *The Education Digest*, March, 1938.⁴⁴

Typical of what objective checks of the results of educational efforts may be like are such measurements as those of H. M. Hamlin, M. E. John, and R. E. Wakeley.⁴⁵ The former study asked the question, "What is the result of the teaching of the desirability of larger legume acreages in extension vocational agriculture classes in six small central Iowa communities?" A general increase of tillable land used for legumes resulted. The following were the author's conclusions.

(a) It is possible to measure, year by year, one of the important out-of-school results of the instruction in agriculture in our schools.

(b) It is possible to determine, with some accuracy, not only the effect of teachings regarding the growing of legumes upon those directly instructed but upon others in a community who have been reached indirectly.

⁴⁴ L. H. Gulick, *et al.*, *Education for American Life: A New Program for the State of New York, School Accounting and Financial Reporting, and A Manual for School Districts*; C. H. Judd, *Preparation of School Personnel*; F. W. Reeves, *et al.*, *Adult Education*; T. L. Norton, *Education for Work*; F. T. Spaulding, *High School and Life*; Elizabeth Laine, *Motion Pictures and Radio, and Modern Techniques for Education*; J. B. Maller, *School and Community, and A Study of the Demographic and Economic Background of Education in the State of New York*; C. E. A. Winslow, *The School Health Program*; A. G. Grace, *State Aid and School Costs*; Ruth E. Eckert and T. O. Marshall, *When Youth Leave School*. New York: McGraw-Hill Book Company, 1938; L. J. Brueckner, *et al.*, *The Changing Elementary School*. Sweet Springs, Mo.: Inor Publishing Company, 1939; Dora V. Smith, *Evaluating Instruction in English in the Elementary Schools of New York*. Chicago: Scott, Foresman and Company, 1941; C. E. Ridley, H. A. Simon, and Henrietta Rybizynski, "Measuring Public Education," *Public Management*, 20: 41-45, 1938.

⁴⁵ H. M. Hamlin, "Measurement of the Effect of School Instruction Through Changes in Community Practice," *Journal of Educational Research*, 18: 315-317, 1928; M. E. John and R. E. Wakeley, "Some Social Results of Training in Vocational Agriculture," *Journal of Educational Sociology*, 8: 141-151, 1934; M. F. Seay and H. F. Clark, *The School Curriculum and Economic Improvement*. Lexington, Ky.: Bureau of School Service, University of Kentucky, 1940, Bulletin, Vol. 13, No. 1.

The 1934 investigation was also in the field of vocational agriculture. The problem considered here was, "How does the training in vocational agriculture influence the social adjustment of high school graduates who remain in the home community?" The findings were that contact with the courses offered resulted in less movement from the home community, more satisfactory occupational adjustment, less active participation in local organizations, and stronger opinion toward farming as an occupation and toward cooperative marketing.

Other illustrations of the threefold attack of sociological research on problems of group living might be cited. It is clear that these include studies of societal development with lessons for the improvement of human institutions and, in particular, organized educational efforts, as well as analyses of the educational enterprise itself, as related to society in general.

D. The Procedures and Techniques of Sociological Research

The trend in sociological research has been that of all human inquiry in all realms of experience. From ancient levels of no-thinking, characterized by decisions based upon superstition, authority, or uncontrolled feeling, more and more as the years come and go there has appeared, on the part of a few leaders and then among groups here and there, the emergence of a doubt of the value of the easy generalization. An open-minded attitude has developed for new and pertinent information, and for an inductive evaluation and tryout of hypothetical solutions, approaching the methods of true reflective thinking. Greater progress has been made in this respect in the natural sciences, but this cannot be permitted to cloud the fact that social science has also advanced toward the level of true problem solving by means of objective data resulting from measurement. There is a difference only of degree, not of kind. Any successful approach to an explanation of phenomena in terms of ordered mind activity is scientific.

Attention has been called (Chapter I) to the early attempt in France to raise the study of society above medieval levels of pseudo-philosophy. Early in the nineteenth century, Auguste Comte first proposed "subordination of imagination to observation in the social sciences."⁴⁶ He conceived a science of sociology. Study of social relationships was pointed in the right direction. Followers of Comte have only been more successful in objectifying his point of view and

⁴⁶ McQuilkin Degrange, "The Method of Auguste Comte: Subordination of Imagination to Observation in the Social Sciences," Analysis 1, in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931.

in advancing farther into the realm of accurate measurement by means of more definite expressions of amount and units for counting.

Attention is called, also, in Chapter II, to the work, about the middle of the last century, of Herbert Spencer, the philosopher of the Darwin group of evolutionists. His volume on sociology⁴⁷ constituted a second attempt to bring order and accuracy into a study of the problems of society.

The early trend toward inductive objectivity in sociological research is carefully traced in a university doctor's dissertation.⁴⁸ From the pioneer, R. M. Mayo-Smith (1895), through E. P. Payson (1898), C. D. Wright (1898), F. H. Giddings (1901), to L. F. Ward (1906), one finds a steady increase in objective attitude toward societal research and more and more concrete suggestion for actual reflective thinking and the use of the statistical method for accurate measurement.

An excellent illustration of the trend toward adequate reflection and the use of more objective units is found in the fifty-two case analyses compiled under the direction of the Committee on Scientific Method in the Social Sciences of the Social Science Council.⁴⁹ From Auguste Comte through W. S. Jevons, W. D. Munro, J. B. Bury, James Bryce, and others to such modern reflective workers as F. H. Allport, W. C. Mitchell, and H. L. Moore, one finds a general trend toward a more scientific attitude and method, greater objectivity in the making and use of measuring instruments, and hence a report of findings on a higher level of value. This improvement in reflective thinking methods is indicated in the titles of the sections under which the illustrations of sociological research are listed: Delimitation of Fields of Inquiry, Definition of Objects of Investigation, Establishment of Units and Scales, Discovery of Spatial Distribution and Temporal Sequences, Interpretations of Change, Interpretations of Temporal Sequences, Interpretations of Relationship Among Unmeasured Factors, Relationships Among Measured but Experimentally Uncontrolled Factors,

⁴⁷ Herbert Spencer, *The Principles of Sociology*. New York: D. Appleton-Century Company, 1900.

⁴⁸ W. A. Binnewies, *A History and an Evaluation of the Quantitative Trend in Sociological Analysis*. Unpublished Doctor's Dissertation, University of Nebraska, 1929; R. M. Mayo-Smith, *Statistics and Sociology*. Columbia University Press Series. New York: The Macmillan Company, 1899; E. P. Payson, *Suggestions toward an Applied Science of Sociology*. New York: G. P. Putnam's Sons, 1899; C. D. Wright, *Practical Sociology*. New York: Longmans, Green and Company, 1899; F. H. Giddings, *Inductive Sociology*. New York: The Macmillan Company, 1901; L. F. Ward, *Applied Sociology*. Boston: Ginn and Company, 1906.

⁴⁹ S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931.

and Relationships Among Measured but Experimentally Controlled Factors.

As suggested in Chapter I, it may be that Vilfredo Pareto⁵⁰ has made a finally fruitful contribution to the problem of objective checks of societal trends, and that his *residues* and *derivations* may become universally used units of measurement among leaders in sociological research. And Carl Snyder, another economist, has recently traced the trend of increase in the use of careful measurement and true thinking methods for generalization and prediction in a specific field of the social realm.⁵¹

The year 1906 may be taken as "the beginning of the scientific period"⁵² in sociological research. The publication of *Folkways* by W. G. Sumner⁵³ begins the extensive use of concrete materials in sociology. An inductive approach began definitely to take the place of vague guess generalizations in the realm of clumsy pseudo-philosophy. The steady spread of this point of view and method among investigators of society may be measured in terms of a count, over the last thirty years, of reports that use the techniques of the frequency table and graphic representation, in such a publication as the *American Journal of Sociology*.

Naturally, this movement would begin first in those phases of social science which were most easily reduced to quantitative terms. These would be the fields where there already existed a standardized unit such as the individual, the dollar, a birth, a death, a marriage, a vote, and so on. The next step then would be into those fields of social process which are more intangible, such as the general behavior patterns of mobility, attitudes, social distance, social forces, the trends and rates of movement of social processes, and the like. For these, norms and standard units of measurement must first be devised. The first quantitative studies of society were those statistical analyses of birth and death rates, number of inhabitants and their economic status and movements of population, some of which date back to very ancient times. These were only incidentally sociological. The strictly quantitative method in sociology did not begin until about 1908, when Giddings and Commons published their first quantitative studies, and only within the last decade has any appreciable advance been made.⁵⁴

⁵⁰ Vilfredo Pareto, *The Mind and Society*. New York: Harcourt, Brace and Company, 1935.

⁵¹ Carl Snyder, *Capitalism the Creator*. New York: The Macmillan Company, 1940.

⁵² E. W. Burgess, "Statistics and Case-Studies as Methods of Sociological Research," *Sociological and Social Research*, 12: 103, 1927.

⁵³ W. G. Sumner, *Folkways: A Study of the Sociological Importance of Usages, Manners, Customs, Mores, and Morals*. Boston: Ginn and Company, 1907.

⁵⁴ W. A. Binnewies, *A History and an Evaluation of the Quantitative Trend*

Although creditable social research proceeds in terms of the universal method of all successful reflective thinking, it has developed rather distinctive techniques.⁵⁵ These are adequately treated in such handbooks as those of G. A. Lundberg, Vivian M. Palmer, and S. A. Rice.⁵⁶ The content of these textbooks consists of such topics as the sample, observation, the schedule, field work, the interview, the diary, case studies, and social research map, documentation, and the like.

E. The Evaluation of Sociological Types of Research

When a list of criteria for sociological research is sought, one should include first of all in method natural, effective mind activity, *reflective thinking*, as analyzed in the Dewey-Kelley steps (Chapter I). No wish-thinking, day-dreaming, or pseudo-philosophy, such as characterized traditional early publication in the field, is any longer considered to be worth while. The scientific method is being accepted by most important modern investigators of society. Sociological research is becoming more scientific.

Obviously, the final test of reflective thinking in the realm of human problems should be *societal development*. As a result of scientific study of the status of society, changes should appear in group relationships, attitudes, and practices, and in the effectiveness of institutions in promoting the efficiency and the happiness of human living. Here appears the necessity for adherence to the objective criteria listed. Continued improvement in social relationships cannot be effected without definite check of progress. Steps of improvement may then become conscious among reflective thinkers, and renewed efforts for further advance on to higher levels of endeavor become possible.

A true *philosophical attitude* toward every problem attacked should be more and more maintained. Instead of depending too carefully on unguided Baconian induction without adequate interpretation, likely hypotheses should be conceived for investigation early in any ordered-

in *Sociological Analysis*. Unpublished Doctor's Dissertation, University of Nebraska, 1929.

⁵⁵ F. S. Chapin, "The Main Methods of Sociological Research," *Sociological and Social Research*, 33: 3, 6, 1948; P. A. Sorokin, "Main Methods, Principles, and Techniques of Sociological Research," *Sociological and Social Research*, 33: 6, 7, 1948.

⁵⁶ G. A. Lundberg, *Social Research: A Study in Methods of Gathering Data*. New York: Longmans, Green and Company, 1929; Vivian M. Palmer, *Field Studies in Sociology: A Student's Manual*. Chicago: University of Chicago Press, 1929; S. A. Rice, *Statistics in Social Studies*. Philadelphia: University of Pennsylvania Press, 1930.

thinking process set up. Then evidence found on their value may be more successfully gathered without waste of effort. Further, these attitudes should become points of view, definite ultimate objectives, operating as aims in the prosecution of every piece of research undertaken.

Obviously, in sociological research, these purposes should constitute *practical objectives*. Definite outcomes, useful in the improvement of society, should be the result. The need for this consummation is immediate and pressing, and has always been so. Pure research is basic; but, in the actual conduct of institutions, daily decisions on installation and administration have to be made. It should be the function of sociological research to see that too large a proportion of these shall not be unthinking, based upon tradition and expediency alone.

Further, it should not be assumed by the reflective thinker in the social realm that just any accepted *research method* is good in the attempted solution of any problem attacked. Careful selective choice should be made to fit the situation of investigation, data available, cooperation obtainable, tools of measurement on hand, and similar considerations. Above all, the unthinking survey should always be avoided, except as preliminary to actual further mind activity on the level of interpretative generalization.

The criterion of *objectivity* cannot be overemphasized. A summation of errors never results in truth. Generalization is valuable in proportion to successful approach to definiteness and certainty in expressions of amount and units of value used. Observation should be divorced from personal bias. Adequate records of group behavior should be available. Objective *measurement*, then, is the criterion. Use should be made of the many new and better tools appearing. But care should be taken that they are always valid for the situation of research and reliably accurate for use. Often this will mean local skill in test making, rather than blind purchase of commercially available tests. Dependable generalizations cannot be announced unless *accepted techniques* are employed in every research procedure where methods used demand careful decisions on the details of what devices and tools shall be used.

As has been suggested, the advance of society should be in terms of worth-while generalizations resulting from rational efforts in problem solution. *Standardization* is the criterion, not in the sense of regimentation of individuals and of the group, but by general agreement on practical objectives the attainment of which will raise group life generation by generation onto higher levels of happy and successful living. Decisions for the new experiences of society should be on the

basis of wide acceptance of high philosophies that are made concrete in daily living.

Finally, every report of reflective thinking by whatever method or of whatever type should provide for *further research* in the same field of endeavor. No generalizations announced have the value of absolute truth. There is always more to do because better techniques become available and new data of evidence are uncovered.

These ten suggested criteria are put in tentative score-card form in Table XXV. It is suggested that student and research groups shall

TABLE XXV
A SCORE CARD FOR SOCIOLOGICAL RESEARCH

Criteria	Scales		
	Low	Medium	High
1	2	3	4
1. Societal development	6.0	7.0	8.2
2. Philosophical attitude	5.0	6.1	7.0
3. Thinking methods	4.7	5.8	6.3
4. Practical objectives	4.5	5.0	5.8
5. Research methods	4.0	4.5	5.2
6. Objectivity	3.5	4.0	4.8
7. Measurement	2.9	3.4	4.2
8. Accepted techniques	2.4	3.0	3.7
9. Standardization	1.5	2.1	3.0
10. Further research	1.0	1.4	1.8
Perfect score (total)	50.0		

not use them unthinkingly. The list should be revised and rescaled in terms of the experience and the best judgment of the research worker and in accord with the actual conditions of the research project under consideration. The details of this scale revision have been given in Chapter VII. Table XXVI is an example of the student use of the score card to evaluate a specific investigation. In the analysis of reports in this field of research, a choice may be made between the use of the score card thus constructed and the completed scales for descriptive, historical, and experimental research given in Chapters VII, VIII, and IX. The latter may be better for more detailed checks of the value of reports that use the basic research methods indicated.

TABLE XXVI
EVALUATION OF A SOCIOLOGICAL RESEARCH REPORT ^a

Criteria	Scores	Discussion
1	2	3
1. Societal development	4	1. The report shows that changes in race attitudes were effected in the case of about forty-five per cent of the students.
2. Philosophical attitude	6	2. A rather broad point of view was taken with regard to the purpose of college teaching and desirable race attitudes.
3. Thinking methods	4	3. The report does not state in detail reflective procedures engaged in.
4. Practical objectives	5	4. The actual changing of student race attitudes was undertaken.
5. Research methods	2	5. Controlled equivalent groups would have made emerging generalizations more valuable.
6. Objectivity	4	6. A sincere attempt was made to measure changes in subjective variables.
7. Measurement	3	7. The tools for measurement were not well made.
8. Accepted techniques	1	8. Many statistical errors were made, such as failing to examine the reliability and significance of raw differences, disobeying the law of the single variables, and the like.
9. Standardization	0	9. No hypothetical criterion for general societal agreement on basic philosophies was suggested or considered.
10. Further research	1	10. General suggestions, based on admitted inadequacies, that something more should be done with the problem were made; but no definite subsidiary emerging problems were listed.
Total	30	
Possible total	50	

^a A. O. Bowden, "A Measurement of the Effectiveness of College Teaching," *Journal of Educational Sociology*. 4: 634-641, 1931.

F. Summary

Sociological research includes a study of all human group relationships. The institutions of society are investigated with the purpose of furnishing recommendations for their improvement. Educational sociology selects organized educational efforts for objective check in terms of reflective thinking. It shows how this institution may cure the ills of society.

A threefold attack on societal problems includes checks of social development with recommendations for the improvement of human institutions, in particular education, as well as analysis of the educational effort itself, as related to society in general.

There has been a marked trend toward objectivity and value of procedures and techniques in sociological research since the time of Auguste Comte. Modern reflective thinking in this realm has been more philosophical and more accurate in the use of tools for measurement.

Sociological research may be evaluated in terms of such criteria as resulting betterment of society, the effective use of philosophical hypotheses, ordered reflective thinking toward practical objectives set up, the use of carefully selected research methods, measurement programs objectively arranged in terms of accepted techniques, general standardization of worth-while generalizations, and definite provision for further research on the problem attacked.

G. Research Exercises

1. Analyze the content of the *American Journal of Sociology* and the *Journal of Educational Sociology* over the last thirty years and report a count of the number of studies using the techniques of the frequency table and the figure or graph.

2. Define and illustrate the following concepts: sociology, education, and educational sociology.

3. Make an annotated bibliography illustrating each of the twenty types of sociological research listed in the total field by the American Sociological Society (Section B).

4. Select, analyze, and evaluate research reports to illustrate the three general types of sociological research discussed in Section C.

5. Illustrate the distinction between the survey⁵⁷ and descriptive research in the field of sociology. What is the function and the value of the survey?

6. On a scale of value in creditable research from no-thinking at the left,

⁵⁷ "In the most limited sense of the word, I should say that a survey is never research—it is exploration. It seeks to define problems, rather than to test hypotheses." R. E. Park, in the "Introduction" to E. S. Bogardus, *The New Social Research*. Los Angeles, Calif.: J. R. Miller, 1926, p. 14.

through median methods, to better efforts and perfect reflection at the extreme right, place the social science research of C. D. Wright, Auguste Comte, L. F. Ward, F. H. Giddings, Herbert Spencer, J. B. Bury, W. C. Mitchell, H. L. Moore, James Bryce, W. S. Jevons, W. G. Sumner, G. S. Counts, John Dewey, C. H. Judd, E. G. Payne, E. K. Strong, J. M. Brewer, P. W. L. Cox, M. C. Elmer, P. S. Lomax, J. J. Loftus, and Florence W. Schaper.

H. Additional Illustrations of Sociological Types of Research

1. L. L. Bernard, "The Function and Content of the First Course in Sociology," *Journal of Educational Sociology*, 9: 231-242, 1935.
2. F. S. Chapin, "A Quantitative Scale for Rating the Home and Social Environment of Middle Class Families in an Urban Community," *Journal of Educational Psychology*, 16: 380-390, 1925; *Experimental Designs: Sociological Research*. New York: Harper & Brothers, 1947.
3. J. B. Conant, *General Education in a Free Society*. Cambridge: Harvard University Press, 1945; *Education in a Divided World*. Cambridge: Harvard University Press, 1949.
4. G. S. Counts, "Education and the Five-Year Plan of Soviet Russia," *Journal of Educational Sociology*, 4: 20-29, 1930.
5. P. W. L. Cox, "Bayonne Junior High School," *Journal of the National Education Association*, 19: 3, 4, 1930.
6. Faris Ellsworth, "Primary Group: Essence and Accident," *American Journal of Sociology*, 38: 41-50, 1932.
7. C. A. Ellwood, "The Fundamental Research in Educational Research in Educational Sociology," *Journal of Educational Sociology*, 8: 4-11, 1934.
8. H. M. Evans and Others, "The Social Character of Problem Solving," *Progressive Education*, 26: 161-183, 1949.
9. E. R. Groves, *American Family*. Philadelphia: J. B. Lippincott Company, 1934.
10. J. K. Hart, "The Building of the City," *Journal of Educational Sociology*, 8: 298-308, 1935.
11. C. S. Johnson, *Shadow of the Plantation*. Chicago: University of Chicago Press, 1934.
12. E. L. Kirkpatrick, "Some Adjustments of Farm Families to Emergencies," *American Journal of Sociology*, 40: 495-502, 1935.
13. D. H. Kulp, "Problems of Rural Education Demanding Sociological Research," *Teachers College Record*, 31: 332-338, 1930.
14. Frank Lorimer and Frederick Osborne, *Dynamics of Population: Social and Biological Significance of Changing Birth Rates in the United States*. New York: The Macmillan Company, 1934.
15. W. C. Mitchell, et al., *Recent Social Trends in the United States: Report of the President's Research Committee on Social Trends*. New York: McGraw-Hill Book Company, 1933, Vols. I and II.

16. Dorothy C. Mott, "Community Survey Technic," *Department of Elementary School Principals Bulletin*, 11: 203-211, 1932.
17. C. C. Peters, "Summary of the Penn State Experiments on the Influence of Instruction in Character Education," *Journal of Educational Sociology*, 7: 269-272, 1933.
18. A. M. Rose, *Studies in Reduction of Prejudice*, American Council on Race Relations, Chicago, 1948.
19. Florence W. Schaper, "The Introductory Course in Sociology in the College for Women in the West, Middle West, and South," *Journal of Educational Sociology*, 7: 37-42, 1933.
20. David Snedden, "Progress Towards Sociologically Based Civic Education," *Journal of Educational Sociology*, 3: 481-496, 1930.
21. I. V. Sollins, "An Experiment in Instruction in Candy Consumption," *Journal of Educational Sociology*, 3: 546-555, 1930.
22. E. K. Strong, "Interests of Men and Women," *Journal of Social Psychology*, 7: 49-67, 1936.
23. T. E. Sullenger, "Approaches to Methods of Community Study," *Sociology and Social Research*, 18: 470-476, 1934, also excerpts in *Journal of Educational Sociology*, 8: 94-97, 1934.
24. F. M. Thrasher, "Ecological Aspects of the Boys' Club Study," *Journal of Educational Sociology*, 6: 52-58, 1932.
25. Frank Waters, *People of the Valley*. New York: Farrar and Rinehart, 1941.
26. J. W. Withers, "Important Problems for Research in the Education of Teachers," *School and Society*, 33: 613-617, 1931.
27. H. W. Zorbaugh, "Mental Hygiene's Challenge to Education," *Journal of Educational Sociology*, 5: 325-333, 1932.
28. Ching-Yueh Yen, "Crime in Relation to Social Change in China," *American Journal of Sociology*, 40: 298-308, 1934.

CHAPTER XIII

The Creative Type of Research

IT HAS BEEN seen in Chapter VII that, in a practical classification of methods and types of research, mind activity, reflective thinking, is conceived of as being carried on in the realm of aesthetic creation. It was suggested also that the product may become objective as prose literature, a poem, a drama, a musical composition, an opera, a dance form, picture, statue, building, or the like. In many graduate centers, this type of research activity is called creative research.

A. Definition of Creative Thinking

As discussed in this chapter, creative research is reflective thinking in a situation of aesthetic values. It may have its origin in a feeling of need for life experiences above and beyond those of ordinary personal or group satisfaction. It may crystallize in a specific problem, which may be treated in terms of hypothetical solution, the getting of experimental evidence, and the final acceptance of worth-while generalizations. For example, in many modern cities, as in Denver, the need arises in the minds of a few far-thinking citizens for something other than the usual geometric arrangement of streets and buildings in the business district. A civic center is conceived, and its production becomes a definite city problem. Reflective thinking is continued by individuals and committees in terms of this solution or that, until hypothetical plans are adopted and investigated experimentally in terms of former experiences and of similar activities in other communities. Then the project begins to take form, and finally appears in conformity with standards of aesthetic evaluation in the thinking of those responsible.

Of the four ways of analyzing human experience reflectively (Chapter XI), this method may be characterized as a stylistic

approach.¹ This is in contra-distinction to the telic, the genetic, and the natural science methods, in which it is shown that there is more possibility of certain prognosis. But this is not to suggest that creative experience is not highly important in the production of personal and group satisfaction. It has the value of revealing identities of intrinsic worth to conform to personally held standards of form, proportion, and balance. It confirms perhaps rather unconsciously held points of view with regard to the status of things as they should be; and this is always satisfying. It contributes to basic philosophies with regard to aesthetics held by individuals or societies. It feeds emotional states by producing feeling tones which harmonize with long-held, habitual reactions to aesthetic situations. It contributes to culture in terms of an implicit approach to experience.

Creative research operates toward the production of objects of aesthetic value through the processes of reflective thinking.²

B. Reflective Thinking in Creative Research

To what extent may this type of investigation be characterized as actual mind activity in terms of the Dewey-Kelley steps (Chapter I)? In the production of an aesthetic masterpiece, is there a feeling of need, the recognition of a problem, the acceptance of hypothetical solutions, and examination of these in terms of experimental evidence? It may be more difficult to find point-to-point illustration than in the case of other accepted methods and types of research; but analysis of the work of outstanding creative artists reveals much in attitude, procedures, and techniques of a similar nature to the activities of experimenters, curriculum-makers, and other research students.

In the discussion of Thomas Munro of Rutgers University on experimental aesthetics, it is pointed out that more than fifty years ago G. T. Fechner proposed "a science of aesthetics which should proceed by observation and induction, rising to generalizations 'from below,' instead of working down by deduction from metaphysics."³ This movement has partly failed because it has not been thoroughly experimental. Thomas Munro takes the point of view given in Chapter I of this work. The argument is that the method of reflective

¹ F. H. Allport and D. A. Hartman, "The Prediction of Cultural Change: A Problem Illustrated in Studies by F. Stuart Chapin and A. L. Kroeber." Analysis 22 in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931.

² E. D. Hutchison, *How to Think Creatively*. Nashville, Tenn.: Abingdon-Cokesbury, 1949.

³ Thomas Munro, *Scientific Method in Aesthetics*. New York: W. W. Norton and Company, 1928, p. 15.

thinking may be used in the realm of aesthetics, even though data there are subjective and rough, a disability also found in other fields such as psychology and the social sciences.

John Martin of the *New York Times* analyzes the thinking process, resulting in generalization in the following passage.

The artist perceives something as yet too intangible to be of the nature of a fact, something in his own experience which because, perhaps, of its juxtaposition to something else takes on a new color, a new meaning and significance; this he expresses through technical means until he has rendered it comprehensible to others through their esthetic functioning. After a number of repetitions—perhaps thousands, perhaps more—it begins to assume the nature of a general experience. Nothing has been added from the outside, nothing new has been made, but there has been a general revelation in extra-intellectual experience of something that belongs essentially to all men. It then becomes possible for the intellect sharpest in analysis and deduction to reduce this once intangible concept to terms of intellectual comprehension, and hence to discover and formulate a law. What was formerly a vague “inspiration” has now become a scientific fact.⁴

Raphael is reported to have said, as a boy, that he could always draw better when he did not think. In spite of this intimation that an artist’s work may be retarded and “sicklied over with the pale cast of thought,”⁵ his mature career of popularity, exceeding that of his contemporaries, Leonardo da Vinci and Michelangelo, is a clear example of practical reflection. As in the mental processes of Mozart, analyzed later in this chapter, a rich background of reflection had merged into a complete set of generalizations, with details concerning the project in hand. Consciousness of this process had been lost, but the product remained. This is like the hunches of the mathematician or the flash of intuition of genius, which seems to omit many steps in the usual mental activities of ordinary minds.

The fact is that both science and art are found in the stream of consciousness that accompanies man’s reaction to experience. John Dewey explains that it is a matter of the place of emphasis, at one time on the immediate objective product of thought, at another on far-off generalizations that must be expressed in abstract words.

The odd notion that an artist does not think and a scientific inquirer does nothing else is the result of converting a difference of tempo and emphasis into a difference in kind. The thinker has his aesthetic moment when his ideas cease to be mere ideas and become the corporate meanings of objects. The artist has his problems and thinks as he works. But his thought is more

⁴ John Martin, *The Modern Dance*. New York: A. S. Barnes and Company, 1933, pp. 64-65.

⁵ William Shakespeare, *Hamlet*, III, 1.

immediately embodied in the object. Because of the comparative remoteness of his end, the scientific worker operates with symbols, words and mathematical signs. The artist does his thinking in the very qualitative media he works in, and the terms lie so close to the object that he is producing that they merge directly into it.⁶

In fact, John Dewey would consider science to be but ancillary to art, its servant, a central art, which summarizes and generalizes the conclusions and the products of all other arts. His characterization is, that

. . . art, the mode of activity that is charged with meanings capable of immediately enjoyed possession, is the complete culmination of nature, and that science is properly a handmaiden that conducts natural events to this happy issue.⁷

The act of creation, then, in painting, in writing, and in musical composition, is in terms of ordered mind activity, reflective thinking. In the case of these aesthetic aims, the generalization eventually takes sensible, objective form. In science, the end product is remote and abstract. The media in either process dictate the result. On the one hand it is beauty; on the other, truth. Their identity is recognized by John Keats in the couplet:

Beauty is truth, truth beauty—that is all
Ye know on earth, and all ye need to know.⁸

This is illustrated in the fact that in most creative art fundamental life philosophies are inextricably interwoven with desired forms of beauty. The objective is abstract truth, associated with forms that satisfy personal aesthetic standards.

R. G. Ellinger of Colorado State College of Education demonstrates the possibilities of reflective thinking in one corner of the field of aesthetics, that of color. The process he analyzes and illustrates is "rational approach" to the problems of color in terms of principles experimentally determined.

I have endeavored to present a way of thinking about color relationships which is, I believe, fundamental to the understanding of colors in combina-

⁶ John Dewey, *Art as Experience*. New York: Minton, Balch and Company, 1934, pp. 15-16.

⁷ John Dewey, *Experience and Nature*. Chicago: Open Court Publishing Company, 1925, Chap. IX.

⁸ John Keats, "Ode on a Grecian Urn," in H. E. Scudder, editor, *The Complete Poetical Works and Letters of John Keats*. Boston: Houghton Mifflin Company, 1899.

tion. It is, in short, the rational approach to good color in so far as intellect may enter the creative field. The place of the personal and emotional contribution in the creative use of color is not overlooked, but is treated in its relation to the universal constants which obtain in all the art forms of man.

I have observed in the fine examples of color of all times certain constants which function in a way to achieve organization. I have attempted in this volume to point out these universal constants, to clarify and interpret the various means of organization, and to demonstrate the operation of certain principles in the organization of the color unit. I use the term color unit to indicate the color project whether it be textile, a painting, an abstract design, a stage or screen setting, or for any of the art needs of industry. In short, the term color unit simply implies the color element involved in any venture into the field of creative color.

Though the book is written primarily for the creative workers in color, the painters, designers, teachers, and students, I have tried to make the matter interesting to the general reader through nontechnical examples taken from common experience. A certain amount of terminology has had to be devised in order to have labels for specific ideas which are not in common parlance.

Everyone without exception uses color creatively, whether in the selection of a costume or in the furnishing of a home. But more than this, I am convinced that everyone may increase his appreciation and enjoyment of good color in combination. To have some insight into the esthetic aspect of color together with a knowledge of the controls of organization will inevitably sharpen one's sensitivity to the color stimulus and will provide a rational basis for judgment in matters of color selection.

I am indebted to the artists, philosophers, and teachers who have studied the creative field and who have discovered and described certain principles of order pertinent to the esthetic unit. The application of these principles to the color unit is, I believe, a new approach in color. In developing this idea I have been aided by the willingness of my students to forsake the customary color procedures and join me in experimental research in the field of color esthetic. Discoveries are continually being made which open up new avenues for study. It is my hope that experimental studies which bear evidence upon the matter of color in organization may eventually establish the study upon as firm yet flexible a basis as has been established in the study of harmony in music.

It need not be demonstrated that man is responsive to the esthetic appeal of color. Throughout history mankind has used color in his artistic expression. Certain color combinations have been found pleasing and satisfying, others distinctly disagreeable or irritating. Moreover, there is evidence, as the great works of art of all ages reveal, of an agreement or identity of response among men to the esthetic unit, whether it be a Coptic weaving, a Persian rug, a Chinese ceramic, or a painting by Titian. The finest color units of the ages, regardless of racial sources, call forth the esthetic approval of man today. It would seem that there must be some universal quality in

art and some universal quality in man that enables this splendid communication.⁹

C. The Objective Forms of Creative Research

As already intimated, the product of the creative type of research may take various forms, depending upon the object of effort of the worker. The purpose of problem solving may be to write a poem, a story, a drama, to compose a symphony or an opera, or to make a cartoon, a mural, a medallion, bas-relief, or statue. A more or less logical category of objectivity might lead from prose forms, through the poem, the drama, symphony, opera, dance, and picture, to the product of the sculptor and the architect.

The classics of *prose literature* are distinctly creative in their conception and form. The work of such masters as T. B. Macaulay, W. H. Pater, Bliss Perry, Thomas Hardy, and Joseph Conrad needs only to be cited in order to have this recognized. The method of Macaulay is analyzed in Chapters II and XVI. It is shown that his method characterizes the procedures of careful reflection. In the writing of *The History of England*, these came out of a feeling that certain historical periods needed more careful investigation and more illuminating exposition. Then came the conception of a clear-cut problem, which was attacked by accepted methods of reflective thinking in historical research.

Two graduate masters' projects may be considered to be creative in the sense that they result in original curriculum segments for the use of public school learners.¹⁰ These are an organization of mathematical recreations for senior high school pupils and a historical account of a specific region for junior high school supplementary reading. In the latter, the agendum of objective, procedures, and techniques includes accepted methods of historical research. This is indicated in detail in the first portion of the report. Then the student wrote to a selected audience, the pupils of the junior high school. In this manner, she produced a piece of literature well fitted to its purpose.

When the realm of *poetry* and the work of the poets is entered, it is perhaps more difficult to analyze the total activity, so that the essential elements of the creative act become apparent. But many bits of

⁹ R. G. Ellinger, *The Organization of Color*. Ann Arbor, Mich.: Edwards Brothers, 1935, pp. iii, iv.

¹⁰ Clifford Cowger, *Mathematical Recreations for High School Students*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1933; Estella J. Bennett, *A Study of Dakota Territory of 1861 and Wyoming South of the Forty-third Parallel*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1926.

personal testimony and reports of familiars show that there is not alone feeling, but thinking as well. For example, Amy Lowell says: ¹¹

But Keats was no mere intuitive poet. He reflected constantly on his art, and the remarks about poetry scattered through his writings prove him to have possessed—beside, and quite apart from, his genius—a very acute and subtle mind.

Contrasting the intellectual capacity of Shelly and Keats, she says:

Keats had an excellent mind, the kind of mind which is well spread out, not the kind which is all squeezed together into one little spot in an otherwise empty cranium. Shelley's opinions on practical affairs were worth nothing; on politics, ethics, and social economics, he talked and acted like a fractious, unreasonable child. Keats, on the other hand, was a perfectly logical, straightforward, and unprejudiced thinker. His emotions might run away with him; his ideas, never. His genius was above and beyond his mind, yet it did not impoverish it, as does the unbalanced genius of poets of lower rank. Shelley's mind was sucked and dwindled by his poetical faculty; Keats's was nourished and energized by his.

In fact, a definition of poetry, as objectively evidential, is indicated by this characterization:

The poet's keen and true evaluation of the facts of human life and the power of transferring his evaluation to us by means of words used at their highest potential energy is poetry. It deals with every phase of existence: nothing is too high, nothing too low. It pierces to the heart of the matter and reveals to us its essence in words which inextricably entangle our own experiences with the poet's vision and which make that vision an actual reality.¹²

The work of Johann Wolfgang von Goethe may be taken as perhaps most representative of the application of the processes of reflective thinking to poetic literature. Like Leonardo da Vinci, his many-sided genius was almost universal. He was poet; but he was also "dramatist, novelist, critic, botanist, physicist, zoölogist, art collector, archaeologist, and court counselor."¹³ And he was at all times a scientist.

He illustrates poetry as a combination of emotion and thinking. This is in terms of the Dewey-Kelley steps in reflection (Chapter I). Poetic activity originates in a feeling tone of need. It is also thus

¹¹ Amy Lowell, *John Keats*. Boston: Houghton Mifflin Company, 1925, pp. 200, 505.

¹² Elsa Chapin and Russell Thomas, *A New Approach to Poetry*. "What is Poetry?" Chicago: University of Chicago Press, 1929, Chap. III, p. 175.

¹³ J. P. Eckermann, *Words of Goethe: Being the Conversations of Johann Wolfgang von Goethe*. New York: Classic Publishing Company, 1933, pp. xii, 19, 148, 175, 333, 340.

motivated throughout the entire mind process. Again and again Goethe's productivity originated on this level. Beauty of nature, of art, of face, and of form stimulated him to poetic expression. Many times platonic passion for young womanhood resulted in poetic beauty, as in the *Elegy from Marianbad*, after he has casually met a charming young lady, when on a visit. Eckermann makes him say with regard to *Werther*:

That is a creation which I, like the pelican, fed with the blood of my own heart. It contains so much from the innermost recesses of my breast—so much feeling and thought, that it might easily be spread into a novel of ten such volumes. Besides, as I have often said, I have only read the book once since its appearance, and have taken good care not to read it again. It is a mass of congreve rockets. I am uncomfortable when I look at it; and I dread lest I should once more experience the peculiar mental state from which it was produced.

Reflection actually begins with a problem situation, and many illustrations of this may be found among the poets. Goethe says:

The world is so great and rich, and life so full of variety, that you can never want occasions for poems. But they must all be occasional poems; that is to say, reality must give both impulse and material for their production. A particular case becomes universal and poetic by the very circumstance that it is treated by a poet. All my poems are occasional poems, suggested by real life, and having therein a firm foundation. I attach no value to poems snatched out of the air.

Then there is the use of objective material from environment, inductive evidence on hypothetical generalization, which gives poetry reality.

Let no one say that reality wants poetical interest; for in this the poet proves his vocation, that he has the art to win from a common subject an interesting side. Reality must give the motive, the points to be expressed, the kernel, as I may say; but to work out of it a beautiful, animated whole, belongs to the poet.

Eckermann praised French poetry in that it

. . . never deserts the firm ground of reality. We can translate their poems into prose, without losing anything essential.

Goethe said:

That is because the French poets have knowledge, while our German simpletons think they would lose their talent, if they labored for knowledge; although, in fact, all talent must derive its nutriment from knowledge, and thus only is enabled to use its strength.

I have never affected anything in my poetry. I have never uttered any-

thing which I have not experienced, and which has not urged me to production. I have only composed love songs when I have loved. How could I write songs of hatred without hating! . . .

But to speak the honest truth, what had I that was properly my own, besides the ability and the inclination to see and to hear, to distinguish and to choose, and to enliven with some mind what I had seen and heard, and to reproduce with some degree of skill. I by no means owe my works to my own wisdom alone, but to a thousand things and persons around me, who provided me with material. There were fools and sages, minds enlightened and narrow, childhood, youth, and mature age—all told me what they felt, what they thought, how they lived and worked, and what experiences they had gained; and I had nothing further to do than to put out my hand and reap what others had sown for me.

In Goethe's autobiography, one finds a statement of his method of poetic reflection in epitome.

I had come to look upon my indwelling poetic talent altogether as Nature; the more so, as I had always been impelled to regard outward Nature as its proper object. The exercise of this poetic gift could indeed be excited and determined by circumstances; but its most joyful, its richest action was spontaneous, nay, even involuntary.

Through field and forest roaming,
My little songs still humming,
I spent the live-long day.

In my nightly vigils the same thing happened: I therefore often wished, like one of my predecessors, to get me a leathern jerkin made, and to accustom myself to write in the dark, so as to be able to fix down at once all such unpremeditated effusions. So frequently had it happened, that, often composing a little piece in my head, I could not recall it, that I would now hurry to the desk and, at one standing, write off the poem from beginning to end; and, as I could not spare time to adjust my paper, however obliquely it might lie, the lines often crossed it diagonally. In such a mood I liked best to get hold of a lead pencil, because I could write most readily with it; whereas the scratching and spluttering of the pen would sometimes wake me from my somnambular poetizing, confuse me, and stifle a little conception in its birth. For the poems thus created I had a particular reverence; for I felt towards them somewhat as the hen does towards her chickens, which she sees hatched and chirping about her. My old whim of making known these things only by means of private readings, now returned to me: to exchange them for money seemed to me detestable.¹⁴

Finally, the process and objective of poetic creation is toward generality, as in all adequate reflective thinking. Note that it has been

¹⁴ J. W. von Goethe, *Truth and Fiction Relating to My Life*. Boston: Dana Estes and Company, 1882.

said, "A particular case becomes universal and poetic by the very circumstance that it is treated by a poet." Further, Goethe explains that "Wherever there is a point, I have detached it from the individual objects, and given it a general application, so that the reader has no want of illusions, but cannot tell how they are really directed." S. T. Coleridge explains that "A poem is a species of composition, which is opposed to works of science, by proposing for its immediate object pleasure, not truth." But in another place he admits that "the immediate purpose of poetry may be the communication of truths; or of facts experienced and recorded, as in history."¹⁵ Further, according to John Langdon-Davis, "Since the urge to discover scientific fact or to perfect scientific *theory* is precisely the same as the urge to write a *poem*, and since the pleasure to be derived from understanding some one else's theory is precisely the same as the pleasure to be derived from reading some one else's poems, it is wrong to distinguish so vitally between *science* on the one hand and *art* on the other: both are children of imagination, both of them ways of discovering and enjoying beauty, both a search for the poetry lurking around the corner throughout the universe."¹⁶

It would seem that one finds in the total creative activity of such minds as that of Goethe and other poets, a true representation of complete reflection from felt need to ordered and evaluated generalization. There is a unity of method in aesthetic production in its various phases, which is not hard to recognize and accept, because of its origin in the emotional and intellectual activity of human mentality. The possibility of reflective thinking, motivated by feeling, is universal. See a clear-cut illustration of this in the writing of *The Psalm of Life*. The theme, the hypothesis, originated in a background of many years of disappointment and grief in human relationships, was elaborated evidentially in the reading of Carlyle and the *Divina Commedia* and *Faust*, and came out finally in the form of a reasoned generalization, "We feel that life is not a dream, . . ." "Life is real! Life is earnest!"¹⁷

That form of literary production, the *drama*, takes a step nearer to objectivity in product. A simple illustration is found in the graduate master's study of Elizabeth Nixon. It is actually a combination of historical and creative research. First, by accepted methods, the period and place of the Meeker massacre in Colorado were investigated.

¹⁵ S. T. Coleridge, "Biographia Literaria," in Ernest Rhys, *The Prelude to Poetry: The English Poets in the Defence of and Praise of Their Own Arts*. London: J. M. Dent and Company, 1894, pp. 159, 160.

¹⁶ John Langdon-Davis, *Man and His Universe*. New York: Harper & Brothers, 1930.

¹⁷ Lawrence Thompson, *Young Longfellow*. New York: The Macmillan Company, 1938, Chap. XXIII.

These were reported in terms of synopses of the life of N. C. Meeker and the events of the massacre, psychological analyses of the Ute Indians and of N. C. Meeker, and summaries of the chief event, its importance, its causes and circumstances, and its value as dramatic material. Then the play, *Strong Sunlight*, was written, embodying the outstanding events and personalities of the historical incident. The objective and procedures of the project are stated thus:

. . . the avowed purpose of this piece of research is to obtain the most sympathetic and psychological interpretation of the Meeker massacre through an attempted analysis of the characters and motives of its participants—those in whom the clash of these very elements of character and motive moved as inevitably toward the tragic denouement as does any Greek Tragedy. To do this, the greatest emphasis has been put upon the study of primary source material, the correlation of which the following chapters will attempt to accomplish as a basis for the ultimate dramatic version.¹⁸

This is an example of careful reflection in the making of an aesthetic production, a play. The need for more reliable knowledge of early Colorado history motivated the project. A clear-cut problem was conceived, the writing of a simple drama based on accurate, historical facts. Then came psychological interpretation in terms of the personalities involved. It is creative research.

The writing of a musical production, such as a *symphony* or an *opera*, is an example of reflective thinking. We are told that the comic opera, *Figaro*, was a work of creation in the combined realms of poetry and music.¹⁹ Wolfgang Amadeus Mozart and his friend, Lorenzo Da Ponte, collaborated. Da Ponte took Beaumarchais' comedy as the background for his libretto. But it was more than a translation. It was literature in the reorganization of the plot, the embodiment of character, and the beauty of the verses. This furnished the motivation for musical composition on the part of Mozart. He wrote the solos, duos, and terzets, all joined in unity by recitative, to fit the plot and to express the emotion of the characters of the story. Here it is clear that one finds a basic feeling of need for poetic expression and musical production, the emotional urge of which is carried through the entire process to a degree greater perhaps than in the case of reflection in other methods of approach to human experience, although the preoccupation of a Pasteur or an Edison is similar (Chapter II). There are also the problems of plot, characterization, and harmony, as well as the basic question—How can the artistic, the stylistic, implicit elements in story and music be effectively combined into a popular

¹⁸ Elizabeth Nixon, *The Meeker Massacre*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1935, p. 5.

¹⁹ Marcia Davenport, *Mozart*. New York: Charles Scribner's Sons, 1932.

form, the comic opera? In a word, one finds here reflection; but the element of feeling is perhaps more persuasive. Further, many of the procedures of experimentation, involving the getting and weighing of evidence, are out of sight, introspective in the consciousness of genius. When Mozart stood at his desk to write, he was copying from "the back of his mind" movements, cadenzas, other musical experiences already thought out in terms of final generalized form.

The unity of all efforts toward aesthetic production is found in a basic similarity of mind activity, in reflective thinking. Very probably because of this, as well as because of invariable acceptance of beauty as the ultimate objective, it is difficult to discover pure types of creative research. For example, the opera involves literature, music, and sometimes the *dance*. As to the dance, one finds it inextricably interwoven with music, drama, poetry, pantomime, and other aesthetic forms.²⁰ C. L. Didelot, father of the Russian ballet, is said to have remarked, "A true dancer must be also a good actor and a poet at heart." And, when the modern dance is analyzed, there is perhaps more of a complex of various forms.

Elizabeth Selden of the University of California, in discussing "the logic of aesthetics,"²¹ holds for the uniqueness and at the same time the interrelation of the arts. She conceives of three realms of artistic creation: space, time, and mind. Space involves masses and forms, color and line. It exhibits four modes of projection: architecture, sculpture, poetry, and graphic arts. The temporal arts are embodied in progression of sound as music; progression of sound, words, and memory as song; and movement of the living form as the dance. The arts of the mind appear through progression of spoken language as the drama and through progression of written language, emotive or intellectual meaning, as literature. There are, of course, overlappings of the three realms of artistic creation. For example, the drama has not alone the time element. It occurs in space, and it is a product of the mind. It is this latter fact that is of most interest here, and one finds the intellectual element strong in dance activities. Elizabeth Selden's analysis is as follows:

In counting the dance as an art of the mind, I do not wish to imply, of course, that its "thoughts" are of the logical order which literature uses, but rather that they are of that order of thinking which simply has to go on as an uninterrupted process of mind in which all awareness, feeling, will, and urge

²⁰ John Martin, *The Modern Dance*. New York: A. S. Barnes and Company, 1933, Part IV.

²¹ Elizabeth Selden, *The Dancer's Quest: Essays on the Aesthetic of the Contemporary Dance*. Berkeley, Calif.: University of California Press, 1935, Chap. II, "The Basic Law of Materials."

to action are contained, as is the dust of metal in the mother lode; the thoughts of which John Dewey says: "Such thoughts are the efflorescence of feeling; the enhancement of a mood or a sentiment is their aim; congruity of emotion, their binding tie"; thoughts that are essentially an awareness of a mood, a feeling, an urge to expression.

The dance has certainly nothing to do with thinking, if we conceive of thinking only in terms of rationalization; but it certainly has everything to do with the succession of such thoughts and feelings as I have outlined, for the dance is a result of these impulses in the dancer's mind. They make him act, move, and, whereas he may do so at first quite intuitively, there will attach to these movements more and more of a selective process—a manner of thinking or feeling in sequences. He may even have moved at once with a strong sense of absolute direction and clear fore-knowledge of the next step. Such a degree of awareness and of willing to do a thing certainly amounts to a process in which the mind is most actively engaged. Besides, the dancer's work bears the imprint of thought-action in a more special sense than do other works of art. Whereas the painter has done his thinking during his work, he afterward detaches the result; the finished painting does not think and feel. But the arts of the mind carry on that process for us: literature thinks for us, the drama speaks thoughts out loud for us, and the dancer thinks and feels before our eyes even if we credit him only with repeating a remembered action so instinct with feeling that we may believe we see the original act in its arising.

Point to point conformity to prescribed steps of reflective thinking cannot, perhaps, be illustrated in the choreography of the dance. However, as intimated above, the work of the individual dancer and of the ballet always progresses in terms of more or less conscious intellectual effort with generalized effects in view. For example, the necessity for a check of previous thinking was recognized by Michel Fokine, formerly of the Marinsky Theatre.

His contribution was profound, but, like an artist, he understood that in dancing, as in the other arts, development does not lie in the annihilation of former achievement, but rather it is its retention for use in newer forms and further development.²²

Furthermore, the wife of Vaslav Nijinsky says of him that:

He was a great admirer of Holbein and Dürer, but most of all he was drawn to the Italians of the Renaissance. He studied their masterpieces carefully, particularly Leonardo, Raphael, and Michaelangelo. He realized that harmony and beauty of movement were of supreme importance, and that technique existed only to enable the artists to express their conceptions more perfectly.

²² Romola Nijinsky, *Nijinsky*. New York: Simon and Schuster, 1934.

Dance creation is also in terms of an ultimate objective, an ideal product consciously sought.

It has not only to express a dramatic action or an emotion, but the movements of the dancer must be each penetrated by the living idea. The idea underlying, as in all art, must be the basis also of the art of movement.

Dance thinking was also in terms of data. These consisted of positions and movements to which names were given, such as *tour en l'air*, *fouletté*, *pas de bourrée*, *pas de trois*, and many more. Vaslav Nijinsky worked unceasingly to invent a satisfactory system of choreographic notation, a vocabulary of the dance, so that the composition of ballets could be put on the level of music production. This would give it permanence, such as the drama and the opera have. It would insure more rapid progress toward ideal goals, because past thinking could be known in its detailed results.

Finally, creative research in the realm of the dance culminated in generalizations, resulting from reflective thought and corroborated by actual tryout in public production. For example, Michel Fokine's ballet, *Carnaval*, is an illustration of five principles which he announced as laws of modern ballet dancing.

a. It is impossible to form combinations of ready-made steps; one must create an expression to fit the subject at hand.

b. Dancing and mimetic gesture have no meaning unless they describe the dramatic action, and gestures can never be used as mere *divertissement*.

c. Conventional gestures can only be used when the style of the ballet demands it. Gestures of the hand alone must be replaced by gestures of the whole body.

d. Groups and *ensemble* dances must be used expressively as a whole and not merely as a symmetrical decorative background for the soloists.

e. And, finally, there must be an unbroken alliance between dancing and the other arts of music and painting. Special ballet music is not required. Music of nearly any fluency can be accepted.

Many illustrations of well-ordered reflective thinking in the realm of the dance might be given. For example, there is the production of the ballet, *Une Nuit de Cléopâtre*, during the first Paris season of the Russian imperial ballet. This was based upon Théophile Gautier's story,²³ in which the queen sought for one night a lover who was willing to die at dawn.

Vaslav, a young soldier, and Karsavina, a slave-girl, a veil carried between them, enter the temple in a dance which is a *pas de deux*, not of conventional

²³ Théophile Gautier, *One of Cleopatra's Nights*. New York: Brentano's, 1890.

supported adagio, but love. The Queen was carried in on a palanquin which could have been a painted mummy-case. Set on the floor, her wrappings were whirled off her by slaves. A black panther of a man crouched under her divan, aching to kill the young warrior who came out of the temple shadows to her with helpless attraction. Cleopatra's part was mimed, not danced, in a semi-stylised manner—not rigid, but reminiscent of the hieroglyphics.

Ida Rubinstein's beauty and magnificent body fitted this part perfectly. The little slave-girl, which was danced by Karsavina, alternating with Fokina, carried the action to the point where Nijinsky made his entrance with infinite verve and *délan*. There was a dark rout of Negroes, a swaying dance of heavy Jewesses with swinging ornaments, and finally a wild bacchanal of Greek captives in an ecstasy of Dionysian frenzy, led by Karsavina and Pavlova—here only a dance in a ballet, but whose substances Pavlova lived on for years later in her Bacchanal.²⁴

The work of Leonardo da Vinci, that ancient modern, is an illustration of the application of the method of reflective thinking to problems in many fields of human endeavor. He was architect, engineer, inventor, artist, musician, sculptor, and always a scientist. His most eagerly sought objective was to conquer the air, expressed in the life-long slogan, "There shall be wings." His letter to the Duke of Milan, when he desired to leave Florence, lists the items of his versatility. He was then fifty years of age.

His more than three years of work on the *portrait* of Mona Lisa Gioconda, his competition cartoon for the Battle of Anghiari, his sculptures, and his mechanical and engineering tasks—all were undertaken in a scientific manner. It is said that the Pope criticized his method and sealed his fate in Italy by saying jestingly, "Alack, this dull fellow will never perform anything; he studies the end before he has mastered the beginning." But this is the method of reflective thinking. The procedures of creative research are long and arduous after the problem has been defined and hypothetical solutions conceived. Then come patient inductive efforts to fit obtainable evidence to possible verity and carefully deductive practical corroboration.

If the details of reflection used by this master artist in the production of pictures like those just mentioned and *The Last Supper*, for example, could be known, no doubt we would have one of the best illustrations obtainable of the application of scientific method to creative work. The urge of aesthetic need, the careful acceptance of a specific problem, its solution in terms of the most practical hypothesis appearing, and its final appearance in beautiful and generalized ob-

²⁴ Romola Nijinsky, *Nijinsky*. New York: Simon and Schuster, 1934. See also Paul Love, "Dance Reviews," *The Dance Observer*, 1: 17, 1934.

jective form—all of those steps would be found distinctively illustrated.²⁵

A creative project in the realm of aesthetics is reported by Estelle Stinchfield of Colorado State College of Education. She says:

For many years the writer has thought that a practical carrying through of a project, which would involve the analysis of the use of art principles which underlie painting, would be of some use to students of art. By such a project, theory and practice could be integrated. Therefore, she chose for her problem: (a) To demonstrate the essential principles of art structure which underlie painting by the execution of a mural; and (b) to analyze this mural so that the principles involved might be clear to the student of art.²⁶

Here, again, one finds preliminary historical methods in the choice of a suitable subject for representation on the west wall of a large classroom in Simon Guggenheim Hall on the campus of Colorado State College of Education. Several subjects, which dealt with early hunting exploits, the Meeker massacre, and similar historical incidents, were considered. Finally, the fencing of the cattle ranges and the coming of irrigation were chosen. In the mural, the passing of the range is symbolized "by incorporating a round-up of cattle in the background of the mural. The cattle are seen coming out of flat-topped hills similar to those north of Greeley, advancing as far as the barbed wire fences, sniffing at the green things and then wheeling sharply back into the hills." The foreground of the picture, *The Coming of the Water to the Uplands* (10 feet, 5 inches by 8 feet, 4 inches), represents workmen digging a ditch and the sugar-beet fields in the center.

In this creative task, the method of reflective thinking is clearly evident. The research artist's purpose is to illustrate and evaluate principles of art structure. Her thinking procedures, in addition to the establishment of the historical background, were (a) a review and statement of principles learned and tested in the class instruction of Percival Tudor-Hart of London, Andre Lhote and Othon Friesz of Paris, and A. W. Dow of Teachers College, Columbia University; (b) an analysis of the organization of ten great mural paintings, as studied in the art galleries of England, France, Italy, and America; (c) an analysis and evaluation of twenty-nine pertinent titles in art literature; (d) an analysis of local history providing a background for the subjects of the preliminary experiments and the final subject

²⁵ D. S. Merezhkovskii, *The Romance of Leonardo da Vinci*. New York: Random House, 1931.

²⁶ Estelle Stinchfield, *A Demonstration and Evaluation of the Principles of Art Structure by the Execution of a Mural*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1935, p. i.

chosen; (e) years of personal experience in painting in watercolor, oil, and tempera, and experiment in fresco to develop a style and technique necessary for the painting of a mural; (f) personal interviews with five experienced Colorado mural painters; (g) personal interviews with five Colorado pioneers; (h) painting the mural; and (i) writing the final research report.

As the product of aesthetic activity becomes more and more objective, it tends to include, in addition to the stylistic approach, that of telic purpose.²⁷ The realm of invention is entered. In addition to the satisfaction of such personal standards as are held by the worker, there should be conformity to, and perhaps discovery of, principles of making, in the relationship of the different types of materials used to each other and to the conditions of the situation where the artist is working. This was seen in the case of the work of Mozart and Da Ponte in the production of the opera, *Figaro*. To a lesser degree, it appeared in the writing of the little drama, *Strong Sunlight*.

Illustrations of the last item in the category leading toward objective production already suggested are found in the use of media such as stone or metal in the making of aesthetic forms. Lorado Taft designing and executing *The March of Time* at the west end of the Midway Plaisance in south Chicago is one example. The monument to Don José Maria Morelas, larger than the statue of Liberty Enlightening the World, is another. This Mexican leader for independence was executed by the Spaniards in 1813. The statue, conceived by Guillermo Ruiz, with the left hand of the soldier priest grasping the sword and the right uplifted, was erected on Janitzio Island, Lake Patzcuaro, in the state of Michoacan. Many classic productions, such as those of Leonardo da Vinci, Michelangelo, Donatello, and earlier, Phidias and the other Greeks, might be cited.

The Italian engraver and sculptor, Benvenuto Cellini, is an outstanding example of a life devoted to artistic production. In his inimitable personal account of 113 sections, mixed with the full-blooded activities of a typical Italian of the Renaissance, are found the details of how he accepted task after task from duke and Pope and carried each through to beautiful completion. Perhaps the outstanding commission of his career was that received from the Duke of Florence in 1545. He had just returned from working for the King of France, and had been known mainly in Italy as a goldsmith.

²⁷ F. H. Allport and D. A. Hartman, "The Prediction of Cultural Change: A Problem Illustrated in Studies by F. Stuart Chapin and A. L. Kroeber." Analysis 22 in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931.

I, poor unhappy mortal, burning with desire to show the noble school of Florence that, after leaving her in youth, I had practised other branches of the art than she imagined, gave answer to the Duke that I would willingly erect for him in marble or in bronze a mighty statue on his fine piazza. He replied that, for a first essay, he should like me to produce a Perseus; he had long set his heart on having such a monument, and he begged me to begin a model for the same. I very gladly set myself to the task, and in a few weeks I finished my model, which was about a cubit high, in yellow wax and very delicately finished in all its details. I had made it with the most thorough study and art.²⁸

The student is referred to the autobiography for the further details of reflective activity covering a period of many years, with final triumph in his masterpiece, the bronze statue of Perseus, holding high the head of Medusa, with his foot on her twisted body. After the wax model came the plaster statue; but this was abandoned for an iron skeleton covered with clay. It was modeled "like an anatomical subject, about half an inch thinner than the bronze would be." This was baked. Then wax was spread on the surface, and a hollow mold of the figure was formed. The statue was clothed with a clay "tunic," and re-enforced with iron girders. Later, the wax was slowly melted and withdrawn, leaving the solid model inside, with space for the molten metal, which was to be poured in. A funnel-shaped furnace was built to enclose the model, so that it stood upright in it, as in a cup. "It was built of brick, so interlaced, the one above the other, that numerous apertures were left for the fire to exhale at." Then a pit was dug, and the statue carefully lowered into it. As the pit was banked with earth, air-vents were introduced to facilitate the flow of the molten bronze. Finally, the furnace was filled with "pigs of copper and other bronze stuff," and melted with resinous pine and green oak wood. The mold filled, and was allowed to cool for two days. The finishing, including necessary polishing, applications of gold, varnish, and other details, was finally completed.

In this project, one finds the essential procedures of reflective thinking. The feeling tone was initiated by desire to satisfy Duke Cosimo, and was continued by the deep, professionally aesthetic urge of the artist. Problem after problem was defined, investigated, and conquered. The final generalization took the form of the finished product.

In fact, in a study of the objective forms of creative research, one invariably finds illustrations of the operation of the usual mind processes of reflective thinking. It is true that they are perhaps more difficult to analyze than are similar procedures leading toward the

²⁸ Benvenuto Cellini, *The Autobiography of Benvenuto Cellini*. Garden City: Garden City Publishing Company, 1927, pp. 317-372.

abstract generalizations of the natural or the social scientist. However, the conclusion must be conceded that only differences of degree exist. There are no essential differences of kind. The fact that the end product in this type of research is objectively present during the entire process of production should make more fruitful further attempts to raise creative work in the field of aesthetic values to higher levels of scientific method. But Thomas Munro cautions that:

Only a method persistently tentative and open-minded deserves the title "experimental," and any attempt to extend scientific method to aesthetics should be made with a constant realization of this fact. Success can never come through a simple transfer of the special procedures and terminology of the older sciences. It is not to be achieved merely by applying a formal logic which has worked well in geometry, or through special laboratory devices which are suitable to the study of simpler phenomena. No amount of speculation in psychological, physiological, or sociological terms can be more than suggestive, when its aim is merely to "reduce" aesthetic phenomena to concepts derived from other fields. Advancing to a more complex and subtle realm of phenomena, the method of science must itself become more flexible, giving rise to new appropriate modes of research and expression. The advance can be made, if at all, only through fresh and extensive observation of aesthetic phenomena, with a persistent effort not to ignore their peculiarities. Previously formed theories will be of service as hypotheses, but must always be regarded with suspicion.²⁹

D. The Evaluation of Creative Types of Research

Criteria of excellence in the realm of aesthetic production are most subtle and most difficult to isolate for discussion, evaluation, and use. This is true in spite of the fact that the end in view is always a concrete product. Obviously, aesthetic values associated with the objective end sought are the chief consideration. In the analysis and evaluation of these, many schools of thought, based on many diverse philosophies, have arisen.

In a rank-order list of criteria, no doubt one should place first of all *beauty*, the ultimate aim of aesthetic activity. Science seeks primarily for abstract truth. However, it has been shown that these two objectives are not always or absolutely disparate. The red thread of similarity is discovered in the elements of reasoning found in all normal mind activity. But, from one point of view, ". . . no scale of values is possible. Beauty is expression created by an artist and re-created by an onlooker; it is therefore a communication from

²⁹ Thomas Munro, *Scientific Method in Aesthetics*. New York: W. W. Norton and Company, 1928, p. 15.

spirit to spirit, and its value thus being personal and individual is not assessable."⁸⁰

The embodiment of beauty in an *objective product* is a criterion of equal importance, which cannot be considered separately. Further, this end is sought on a level of *feeling* more continuous, and often more intense, than in other forms of reflection. Very probably the presence of the concretely objective end, constantly changing toward perfection, as conceived in the mind of the creator, causes this. Contrast again the natural scientist at work with the aesthetic artist. The former cannot see his end. It cannot be envisaged as an actual presence, a comparison for stimulation of effort. On the other hand, the creative worker profits by this more objective motivation. It may be that there are differences of feeling, of stimulation, and of final values experienced as the creative worker finds himself on a scale of objectivity such as : (a) prose literature, (b) poem, (c) drama, (d) symphony, (e) opera, (f) picture, (g) dance, and (h) sculptured or constructed form.

By definition, there are, in the creative type of research above all, those standards for ordered reasoning involved in all creditable *reflective thinking*. These are the six elements of the Dewey-Kelley process (Chapter I). No doubt, as already intimated, the first of these, the recognition of need, is often deeper and more pervasive; although, when one compares the absorption and the intensity of pre-occupation of a Pasteur or a Lister with the feeling tone of Leonardo da Vinci's activities or Nijinsky's work, there is great similarity in the emotional element.

The ends sought by the art creator are always *personal aesthetic standards*, not more or less vaguely held points of view. They have to do with such sensibly grasped principles as those of form, proportion, balance, and the like. In fact, in their summated entirety, they constitute the *aesthetic philosophy* of the art worker, comparable to that ultimate-ultimate objective,⁸¹ that basic assumption underlying every research project in whatever realm undertaken.

Aesthetic thinking finds itself on distinctive levels of investigation of experience. There is, perhaps, more often an *implicit approach*, rather than explicit denotation, which is satisfied only with manipulation and modification of environment. But this element is obviously different on the different levels of objectivity that have been listed.

⁸⁰ F. W. Westaway, *Scientific Method*. New York: Hillman-Curl, 1937, p. 568.

⁸¹ Roscoe Pound, "The Social Order and Modern Life," in *The Creative Intelligence and Modern Life*. University of Colorado Semi-centennial Series. Boulder, Colo.: University of Colorado, 1928, Vol. V, pp. 94-103.

Toward the right of the scale, one finds more and more of the *explicit approach*. In the fourfold conception of analysis of experience (the natural science, the genetic, the telic, and the stylistic), artistic creation is more often strictly *stylistic* in its end and aim. It seeks for objects that can be aesthetically satisfying to personally held emotional standards, although the *telic* method is stronger as one proceeds again toward the right end of the category of objectivity. Here one finds making, which requires invention of new forms and relationships.

TABLE XXVII
A SCORE CARD FOR THE CREATIVE TYPE OF RESEARCH

Criteria	Scales		
	Low	Medium	High
I	2	3	4
1. Beauty as an objective	6.0	7.0	8.2
2. Objective product	5.0	6.1	7.0
3. Feeling tone	4.7	5.8	6.3
4. Reflective thinking	4.5	4.9	5.8
5. Personal aesthetic standards	4.0	4.5	5.2
6. Basic aesthetic philosophy	3.5	4.0	4.8
7. Implicit approach to experience	2.9	3.4	4.2
8. Explicit approach to experience	2.4	3.0	3.7
9. Stylistic approach	1.5	2.1	3.0
10. Telic invention	1.0	1.4	1.8
Perfect score (total)	50.0		

These ten criteria for creative research are put in score-card form in Table XXVII. As in Chapters X, XI, and XII, it is suggested that students form group judgments on the list, dropping or adding items that they agree upon. If this is done, the score card can then be rescaled, as described in Chapter VII, for use in analyzing and evaluating research studies. Table XXVIII illustrates a student evaluation of a specific report of the creative type of research.

E. Summary

The creative type of research is in terms of reflective thinking in the realm of aesthetic values. It employs basically the implicit and stylistic approach in an analysis of human experience. It evaluates

the aesthetic product in terms of personally held standards of value. Its objective is beauty and at the same time truth.

TABLE XXVIII
EVALUATION OF A CREATIVE RESEARCH REPORT ^a

Criteria	Scores	Criticism
1	2	3
1. Beauty	0.0	1. The child's schema for drawing the human figure were sought, not beauty of product.
2. Objective product	7.0	2. The forms obtained were as objective as any drawings can be.
3. Feeling tone	6.0	3. The absorption of all child activity no doubt maintained here.
4. Reflective thinking	5.8	4. The research was well organized and carried through.
5. Personal aesthetic standards	5.0	5. No doubt these were vaguely operative.
6. Basic aesthetic philosophy.	4.0	6. It might be assumed that the graduate student, seeking her master's degree, possessed such a background.
7. Implicit approach	3.8	7. There was perhaps less of this than of the more concrete attitude.
8. Explicit approach	3.0	8. Very probably this was the main point of view.
9. Stylistic approach	2.0	9. There was not much as subtle as this.
10. Telic invention	1.0	10. This element may have varied, but on a simple level.
Total	37.6	
Possible total	50.0	

^aHelen A. Zesbaugh, *Children's Drawings of the Human Figure*. Chicago: University of Chicago Press, 1934.

Creditable creative thinking is in terms of the usual steps of mind activity in the conception and solution of a problem. It differs from other types of reflection in the fact that the initial feeling attitude is perhaps more pervasive and more continuous throughout the entire process. Its end and purpose is, of course, more objective than in the case of science, which looks toward final abstract generalization.

The aesthetic product is present and growing from the beginning. It has all of the values of the emotion of immediate personal possession.

A category of objectivity in method and in process in the realm of aesthetics may be the work of the prose writer, the poet, the dramatist, the musical composer, the opera librettist and composer, the dance choreographer, the painter, the sculptor, the architect.

There is unity and at the same time complexity in the realm of aesthetic production. An identical objective, beauty, is always in view. The process of the master artist is that of reflective thinking, motivated and constantly shot through with deep feeling. Pure types are perhaps the exception, because of overlapping of purpose and effort. The opera unites literature, music, and the dance. The individual dance and the ballet are in terms of music, drama, poetry, and other aesthetic forms. All art forms are unique, and at the same time interrelated.

Criteria for creditable creative research, in addition to the necessary attitudes and methods of all reflective thinking, include a strong, pervasive, and continuous feeling tone, an objective product constantly present, and explicit approach to experience, as well as implicit understanding, truth in the form of beauty as an objective, the satisfaction of personally held aesthetic standards, a basic aesthetic philosophy, the stylistic attitude in analysis of environment, as well as more and more telic invention, as the concrete end of a category of objectivity is approached.

F. Research Exercises

1. List nine specific works of aesthetic creation on a scale of objectivity of product.
2. Analyze the production of a noted painting in terms of the Dewey-Kelley steps in reflective thinking.
3. Analyze a specific creative project in the field of music in the same manner; one in the field of dance, also.⁸²
4. Illustrate specifically Dewey's distinction between science and art (Section B).
5. Illustrate the uniqueness of artistic production.
6. Illustrate interrelationships and overlapping in the field of aesthetics.
7. Explain and illustrate the inspirational hunches of genius in aesthetic production.
8. Characterize and contrast the thinking methods of the artist and of the scientist.

⁸² J. L. Mursell, *The Psychology of Music*. New York: W. W. Norton and Company, 1937; H. L. Spreen, "Modern Dance as a Creative Art Form," *Teachers College Record*, 50: 269, 270, 1949.

G. Additional Illustrations of the Creative Type of Research

1. R. E. Arnold, *Plastic Painting Methods*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1941.
2. Marjorie H. Batchelder, *A Marionette Production of "The Birds" by Aristophanes*. Unpublished Master of Arts Thesis, Ohio State University, 1934.
3. K. I. Brown, "To Create: To Cause to Come Into Existence," *Journal of General Education*, 3:34-40, 1948.
4. R. A. Clarke, "General Semantics in Art Education," *School Review*, 56:600-605, 1948.
5. R. W. Faulkner, *Terra Cotta in the School Art Program*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1937.
6. Dorothy Getz, *A Group of Oil Paintings*. Unpublished Master of Arts Thesis, Ohio State University, 1932.
7. Pauline Hering, *"Tom Sawyer" as a Children's Theatre Project*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1934.
8. Mary W. King *Illustrations for a Juvenile Book*. A Master of Arts Thesis, Ohio State University, 1933.
9. Bernice E. Magnie, *The Prairie Pines: A Story of the Oregon Trail*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1938.
10. E. L. McCollum, *Symphonic Poem in D Minor*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1940.
11. Helen G. McGrew, *A Prompt Book and Production of Lula Volmer's "Sun-Up"*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930.
12. Mary V. Mims, *A Compilation of Norse Myths for Grade Four*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1934.
13. D. I. Moore, *Requiem for an Unknown Hero*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1940.
14. Tsune Noguchi, *Techniques in Oil and Water-Color Painting*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1941.
15. I. D. Reid, *In a Minor Key: Negro Youth in Story and Fact*. Washington, D. C.: American Council on Education, 1940.
16. Margaret Steenrod, *A Study in Soft Porcelains*. Unpublished Master of Arts Thesis, Ohio State University, 1934.
17. E. L. White, *A Comparative Study of the Intellectual Factors Involved in the Drawing of Twelve-Year-Old White and Negro Children*. Unpublished Master's Thesis, Fisk University, 1933.
18. D. K. Wiest, *Creative Art Expression through the Study of Modern Stage Design*. Unpublished Master of Arts Thesis, Colorado State College of Education, 1940.

CHAPTER XIV

Research in Curriculum-Making

IT HAS BEEN said that theory is always at least fifty years ahead of practice. With regard to the public school curriculum, this is very probably an understatement.¹ After the strangle hold of Aristotle on social information and attitudes had been somewhat loosened, Rousseau and his followers introduced the idea of individual differentiation. From that time, a personal and functional purpose of education has been conceived and modified by each economic and social advance. But the essential content and method of the school curriculum is relatively unchanged today, except in experimental laboratories and in many advanced city systems. Those responsible still disregard actual things that will be done, overestimate the importance of factual information, and depend too sincerely on the theory of transfer.² For this reason, and because of the recent increase in attempts to revise the curriculum, as evidenced by the setting up of curriculum centers and the work of many committees, curriculum research merits careful consideration. Further, it is found that many, if not the majority, of beginners in educational research working toward a master's degree use curriculum procedures in their studies. Note that about one third in Table VI and over forty per cent in Table VII, Chapter III, of all research studies listed are on curriculum problems, smaller proportions dealing with teacher education, administration, finance, teaching, and the like. Note also, Chapter III, that eighteen per cent of 364 masters' and doctors' theses and dissertations completed in four major California universities in 1947-48 were in curriculum research.

¹ W. A. McCall, "How Wide is the Gap Between Principle and Practice?" *Teachers College Record*, 37: 603-606, 1936.

² R. M. Hutchins, "The Confusion in Higher Education," *Harper's Magazine*, 173: 450-458, 1936.

A. Definition of Curriculum Research

As in other discussions of research in earlier chapters, the claim here is not for a distinctive, basic method. Curriculum research deals with those rather generally agreed upon procedures and techniques that lead to a better selection of socially valuable content material, its functional organization, and its validation and verification in actual use. It will be shown in this chapter that all of the creditable thinking processes found in the seven methods and types of reflection analyzed and illustrated in Chapters VII to XIII may appear in use when a well-conceived program of curriculum-making is set up. Curriculum revision is research if it isolates problems of course content and organization and methods of teaching, accepts hypotheses for their solution, and gets all of the evidence obtainable on these tentative conclusions. Then good generalizations for the conduct of educational effort will appear, and experimental tests of their permanency can be made for prediction values.³

B. Procedures and Techniques of Curriculum Research

The historical trend in the development of curriculum research cannot be traced here. H. O. Rugg⁴ of Teachers College, Columbia University, and W. E. Peik⁵ of the University of Minnesota have published excellent analyses of the movement.

The activities of curriculum-making and of curriculum-revision committees and centers are becoming rather well standardized. From more or less unorganized efforts to present new courses by title or revise old curriculum segments on the basis of individual or group opinion,⁶ curriculum-making is coming closer to true research in terms of the processes of reflective thinking. Analyses of a number of the procedures of early and later efforts will be given.

Arranged chronologically, the plan used in 1920 at Lincoln School, Teachers College, Columbia University, comes first. Here Harold Rugg and his associates, in their attack on the content and the organiza-

³ C. H. Judd, "The Place of Research in a Program of Curriculum Development," *Journal of Educational Research*, 17: 313-323, 1928; E. L. Thorndike, "Curriculum Research," *School and Society*, 28: 569-576, 1928.

⁴ H. O. Rugg, *Curriculum-Making: Past and Present*. Washington, D. C.: National Society for the Study of Education, 1927, Yearbook XXVI, Part I.

⁵ W. E. Peik, "A Generation of Research on the Curriculum," Chapter IV in F. N. Freeman, et al., *The Scientific Movement in Education*. Washington, D. C.: National Society for the Study of Education, 1938, Yearbook XXXVII, Part II, pp. 53-67.

⁶ F. L. Whitney, *Manual and Course of Study of the Public Schools, Grafton, North Dakota*. Grafton, N. D.: Board of Education, 1911.

tion of the public school social science curriculum, set up the following procedures:

LINCOLN SCHOOL, 1920

1. Study of the problems of contemporary life.
2. Study of the basic generalizations of the social sciences.
3. Study of the basic meanings and concepts.
4. Study of the great movements and themes underlying the development of American life and of the focal persons, events, and facts of time and place location.
5. Study of grade placement and organization of materials by scientific method.

A program of research including (1) "the biography of ideas" which is sketched in Chapters X and XI of this present book, (2) twenty-five studies of various phases of modern civilization and of the psychological organization of materials for the school, their grade placement and teaching methods, (3) the co-operative trial of the experimental editions of the Social-Science Pamphlets for seven years by several thousand teachers and administrators . . . tests and appraisals made of the pamphlets as teaching materials . . . prolonged conferences with co-operating teachers . . . evaluations of the materials obtained through thousands of objective tests.

Objective research was the keynote of the whole enterprise. Being without precedent and extensive beyond example, it required the collaboration of many minds, especially in technical studies. The technical investigations included twenty-five studies: three studies of existing curricula in history, geography and civics, of the procedure of national committees from 1892 to 1921 and of pupils' abilities and attainments; thirteen studies of what problems of contemporary life to teach, of the chief trends of civilization and of the central concepts and principles which educated minds use in thinking about them; three studies of the grade placement of curriculum materials and of the development of pupils' abilities; six studies of learning and of the organization of curricula.⁷

Contemporary with this private school plan and representative of those now continuing are the procedures used by teacher committees in the public school system of Denver, Colorado.

DENVER, COLORADO, 1922⁸

1. Survey of professional literature and research.

⁷ Harold Rugg, "A Preface to the Reconstruction of the American School Curriculum," *Teachers College Record*, 27: 600-616, 1926; *That Men May Understand: An American in the Long Armistice*. New York: Doubleday, Doran and Company, 1941, pp. 44, 45; and *Man and His Changing Society* (twenty-book series of elementary and secondary school textbooks). Boston: Ginn and Company, 1929-1941.

⁸ A. L. Threlkeld, *The Denver Program of Curriculum Revision*. Denver: Denver Public Schools, 1927, Monograph No. 12.

2. Formulation of objectives.
3. Statement of guiding principles.
4. Selection and organization of subject matter.
5. Consultation with specialists.
6. Preparation of bibliography.
7. Preparation of table of contents and index.
8. *Continuous revision.*

Coming to later practices in curriculum revision, a number of analyses are presented in more recent publications. Representative of procedures used in city school systems are those for secondary school revision in Rochester, New York, and in Bessemer, Alabama.

ROCHESTER, NEW YORK, 1934⁹

1. Survey of the work of the schools.
2. Study of needs revealed.
3. Establishment of organization for revision.
4. Gathering of literature on curriculum building.
5. Study of curriculum theory and practice.
6. Analysis of objectives.
7. Selection and arrangement of content to meet objectives.
8. Decisions as to form of curriculum.
9. Development of tentative course.
10. Supplying all teachers with materials for classroom tryout.
11. Providing for organization of teachers and principals with new material.
12. *Definite establishment of certain experimental classes and situations.*
13. Provision for teacher comment and criticism.
14. Provision for expert counsel.
15. Re-revision in the light of a semester's experience.
16. Development of a second edition of the course embodying valid suggestions and criticisms.
17. Provision for second classroom tryout.
18. Analysis of entire curriculum to eliminate overlapping.
19. Analysis of entire curriculum to correct poor grade placement.
20. Analysis of entire curriculum to determine relative load for ability ranges.
21. Analysis of entire curriculum to effect horizontal and vertical condition.
22. Testing program.
23. Study of textbooks.
24. Final addition and changes.
25. Editing for printing.
26. Cooperation with press and local organizations for publicity and understanding.

⁹ E. S. Lide, *Procedures in Curriculum Making*. National Survey of Secondary Education. Washington, D. C.: United States Office of Education, 1934, Monograph No. 18, pp. 20-22.

BESSEMER, ALABAMA, 1934¹⁰

1. 1930-31
 - a. Orientation through a series of lectures.
 - b. Direction of the incidental collection of materials.
 - c. Unification and co-ordination of all work.
2. 1931-32
 - a. Lectures on special topics.
 - b. Survey of various aspects of education in Bessemer.
 - c. Examination of present curriculum practices; collection and evaluation of curriculum material.
3. 1932-33
 - a. General discussion by selected leaders on curriculum reorganization and adjustment.
 - b. Survey results and materials made available to all workers.
 - c. Preparation, testing, and revision of materials.
 - d. Unification and co-ordination of all work.
 - e. General review, revision, and adoption of tentative curriculum.

Representative of procedures for curriculum-making used in state school systems are those in Arkansas, Mississippi, and Texas.

ARKANSAS STATE DEPARTMENT OF EDUCATION, 1934¹¹

1. *First year*: A study of the needs of the child and society as a basis for improving the instruction.
2. *Second year*: A continuation of the study of such needs and the development of appropriate instructional materials.
3. *Third year*: A further development and tryout in the classroom of instructional materials produced during the second year.
4. *Fourth year*: Selection and organization of these materials for publication in a state course of study that will be used to guide teachers in their efforts to improve instruction continuously.

MISSISSIPPI STATE DEPARTMENT OF EDUCATION, 1934¹²

1. *First year*: Analysis of existing curriculum program.
2. *Second year*: Exploration into new materials and new procedures.
3. *Third year*: Tryouts in selected classroom situations.
4. *Fourth year*: Tryouts and revision by all teachers.
5. *Fifth year*: Selected materials used by all teachers.

TEXAS STATE DEPARTMENT OF EDUCATION, 1934¹³

1. Study for orientation.

¹⁰ *Ibid.*, p. 22.

¹¹ State Department of Education, *The Arkansas Cooperative Program to Improve Instruction*, Bulletin No. 1, 1933.

¹² State Department of Education, *Mississippi Program for the Improvement of Instruction*, Bulletin No. 1, 1934.

¹³ Texas State Department of Education; *Handbook for Curriculum Study*, Bulletin of the State Department of Education, 1934.

2. Production of materials of instruction.
3. The trying out of courses in selected schools.
4. The installation of courses and the setting up of a permanent curriculum organization.

Paralleling procedures and techniques actually used in programs for curriculum revision are a number of critical proposals that aim to lift these activities onto the level of creditable educational research. The pioneer discussions in this field are those of W. W. Charters of Ohio State University and Franklin Bobbitt of the University of Chicago.

W. W. CHARTERS, 1923¹⁴

First: Determine the major objectives of education, by a study of the *life of man in its social setting*.

Second: Analyze these objectives into *ideals* and *activities* (including mental and physical), and continue the analysis to the level of working units.

Third: Arrange these in order of importance.

Fourth: Raise to positions of higher order in this list those ideals and activities that are high in value for children but low for adults. But fundamental units that have adult value and that are not contrary to the law of *difficulty* should be taught.

Fifth: Determine the number of most important items of the resulting list that can be handled in the time allotted to school education, after deducting those which are better learned outside of school.

Sixth: Collect the best practices of the race in handling these ideals and activities.

Seventh: Arrange the materials so obtained in proper instructional order, according to the psychological nature of the child.

FRANKLIN BOBBITT, 1924¹⁵

First: Discover the *activities* that *ought* to make up the lives of men and women; and, along with these, the abilities and personal qualities necessary for performance. These are educational *objectives*.

The activities once discovered, one can see the *objectives* of education.

The first step in curriculum-making is to decide what specific educational *results* are to be produced.

Second: The major human actions having been defined, the *second step* is to take them, one after another, and *analyze* them into their more specific activities.

It is good to state each *activity* in terms of what the pupil will do or express.

¹⁴ W. W. Charters, *Curriculum Construction*. New York: The Macmillan Company, 1923.

¹⁵ Franklin Bobbitt, *How to Make a Curriculum*. Boston: Houghton Mifflin Company, 1924, and *The Curriculum of Modern Education*. New York: McGraw-Hill Book Company, 1941.

In this analysis, one will first divide his field into a few rather large units; and then break them up into smaller ones. This process will continue until he has found the quite specific activities that are to be performed. At all stages of the analysis, attention should be fixed upon the *actual activities* of mankind.

Third: In locating the objectives that require special emphasis, the diagnostic method of discovering the *personal* and *social shortcomings* to be overcome is most fruitful.

Fourth: The curriculum-maker will take the objectives, sometimes singly and sometimes in groups, and discover what the *pupils* should *do* and *experience* by way of achieving the desired results.

Education is primarily for adult life, not for child life.

Never will a subject be placed in the general training of all persons because it is of specialized value for *certain occupations*.

Fifth: Nothing should be done by the schools that can be sufficiently well accomplished through normal processes of living.

Sixth: Stress is placed on normal processes of living, desirable types of behavior.

Seventh: Determine grade objectives or progress objectives. Make grade standards objective. Let each department find the objectives that are its responsibilities, consisting of what the pupils should do and experience by way of achieving the desired results. Emphasize the play level, keeping educational ends in view.

Another pioneer in curriculum revision is L. T. Hopkins of Teachers College, Columbia University, who took part in the early program in the Denver public school system. He analyzes curriculum-making in terms of twenty-seven procedures:

L. T. HOPKINS, 1929¹⁰

1. Study the aims of education that have been determined by the aims committee. If not available, set up aims of your own.
2. Study the aims of all of the different branches of study that were set up by the aims committee. If these are not available, set up aims for your own branch of study and outline its general relation to the other subject matter fields.
3. Study in detail the aims of your particular branch of study and those that are suggested for the subject or subjects in which you are to work. If these have not been indicated tentatively by the aims committee, set them up yourself.
4. Orient yourself as widely as possible within your branch of study and your particular subject.
5. Set up criteria for the selection of aims for your subject.

¹⁰ L. T. Hopkins, *Curriculum Principles and Practices*. Chicago: Benjamin H. Sanborn and Company, 1929, pp. 422-423.

6. Select the aims of your subject, in accordance with these criteria, and state them in as definite form as possible.
7. Set up criteria for the selection of content.
8. Select content, in accordance with these criteria, which will function to attain the aims.
9. Check the aims with the content and the content with the aims. If they do not harmonize, change one or the other.
10. Set up criteria for the organization of content.
11. Make a preliminary organization of content.
12. Agree upon criteria for the selection of method.
13. Select the general methods that apply to the course of study as a whole, and the specific methods for each unit.
14. Check both methods and content to see that they will function to achieve the aims.
15. Organize the material into consecutive teaching units and course of study form.
16. Set up criteria for the selection of outcomes.
17. Select the outcomes.
18. Try out units of content in the classroom to see that these outcomes can reasonably be expected to result from the content and method. If not, make such changes as are necessary.
19. Check again through the course of study to see that changes which may have been made in the content, methods, or outcomes have not affected the aims.
20. Agree upon criteria for the selection of measuring instruments.
21. Select and explain the use of the best measuring instruments for the particular subject.
22. Try out the course of study for at least one semester in a few representative schools.
23. Revise the course of study in the light of the information obtained from the tryout.
24. Prepare a manual for pupils wherever desirable.
25. Install the course of study for general use in the school system.
26. Continue the process of revision as the strengths and weaknesses of the course of study appear.
27. Bring up to date each course of study at least once in five to ten years.

The National Survey of Secondary Education gives detailed proposals for country-wide curriculum revision in terms of ten procedures:

NATIONAL SURVEY OF SECONDARY EDUCATION, 1934¹⁷

1. Secondary cooperation and interest.
2. Organizing committees.

¹⁷ E. S. Lide, *Procedures in Curriculum Making*. National Survey of Secondary Education. Washington, D. C.: United States Office of Education, 1934, Monograph No. 18.

3. Conditions of work.
 - a. Training teachers.
 - b. Making literature accessible.
 - c. Provisions for meetings.
 - d. Relation to regular duties.
4. Selecting and organizing material.
5. Co-ordinating and correlating work.
6. Trying out tentative course.
7. Assembling the course.
8. Training in use of new course.
9. Approving results.
10. Continuous revision.
 - a. Agency directory.
 - b. How criticism secured.
 - c. How experiments conducted.
 - d. Agency deciding changes made.

Objective curriculum-making techniques have been suggested by the Bureau of Educational Research at the University of Illinois to include activity analysis, determination of consensus of opinion, correlation analysis, and controlled experimentation.¹⁸

These analyses of actual practices in revision of the public school curriculum, together with the modern concrete proposals of good research procedures and techniques that should be used, show a significant trend toward actual reflective thinking in this area of educational problems. Perhaps it would be more accurate to say that the succeeding programs of curriculum-making illustrate and carry to effective detail the early practices in Lincoln School and the Denver public school system. These curriculum activities are far removed from the unthinking guess and scissors-and-paste techniques once prevailing. They envisage the methods, the procedures, and the techniques of creditable social science research. To sum up and make concrete the present status of curriculum research, the following list of procedures is given, as rather well agreed upon in the more advanced centers:

PROCEDURES IN CURRICULUM RESEARCH

1. Check present offerings.
 - a. Ultimate aims.
 - b. Details of content.
 - c. Teaching methods.
2. Analyze all available research reports.
3. Determine social objectives.

¹⁸ W. S. Monroe and M. D. Engelhart, *The Scientific Study of Educational Problems*. New York: The Macmillan Company, 1936, pp. 419-425.

- a. Aims:
 - (1) Ultimate objectives.
 - (2) Specifics and units of content.
- b. Methods:
 - (1) Indirect.
 - (2) Direct.
4. Select course content tentatively.
5. Secure the judgment of specialists on course content.
6. Organize the course.
 - a. Sociological.
 - b. Psychological.
 - c. Logical.
7. Try out the course experimentally.
8. Revise the curriculum.

1. *Check present offerings.*

It is obvious that any listing of curriculum procedures to be carried through cannot be taken to mean a strict chronological order. However, the details of the course or curriculum segment to be revised should be critically known before much can be done to improve it.¹⁹ This means an analysis and listing of the items of content as now used. It answers the question, "What is now taught?" It should come out as a discovery of the actual big aims of the course, its ultimate objective, together with all items of detailed offerings in everyday classroom teaching. Perhaps most often this analysis is not carried to the level of minutest detail. Actual things taught are included in more or less inclusive unit titles, if any check at all is made of present offerings. The procedures in making the Connersville,²⁰ Indiana, arithmetic course are good examples of careful analyses of the occurrence of thirty topics in forty-seven courses in use and of time allotments in ten American school systems.

This check should include also an answer to the question, "How is this material taught?" An analysis of teaching method should be made in order to have a complete picture of present status in curriculum aims, content, and classroom teacher activities.

2. *Analyze and evaluate all available research reports.*

If the curriculum revision project is to be in terms of reflective thinking, as in all creditable research, the details of every previous related investigation should be known. It cannot be assumed that a complete background of information is already present in the case of any individual or committee. This new review of pertinent literature in the field is placed near the beginning of curriculum procedures, but it is probable that there will be much

¹⁹ Florence B. Stratemeyer and H. B. Bruner, *Rating Elementary School Courses of Study: A Report of the Results Secured from Rating Nine Thousand Elementary School Courses of Study*. New York: Bureau of Publications, Teachers College, Columbia University, 1926.

²⁰ G. M. Wilson, *Connersville Course of Study in Mathematics for the Elementary Grades*. Baltimore: Warwick and York, 1922.

critical reading parallel to everything done in the curriculum-making problem under attack.

3. *Determine social objectives.*

Having a detailed knowledge of the present status of the curriculum in terms of actual things taught, the obvious inquiry is, "What ought to be taught?" The answer, as given by curriculum specialists, is: Teach to the group under instruction the things that they are now doing and that they will do, so that they may do them better. This is the social survey for curriculum content, first suggested in modern times by Herbert Spencer²¹ in 1861 in his chapter on "What Knowledge is of Most Worth?" The answer made at that time was distorted by the resurgent interest in natural science. A modern answer will include all phases of social living which touch the individual and group activities of human society.²²

Social objectives are on two levels of generality. There are those most important philosophical points of view, the ultimate aims, which point the way and direct the details of the specifics of curriculum activities. These are basic, and should be well conceived. However, in the history of the curriculum, they have been most often "faith objectives"²³ only, large, glittering goals, stars to indicate direction of effort, but perfectly useless as concrete guides for an answer to the question, "What should be taught?" They have not been analyzed in terms of specifics of content and teachable units for instruction. An example is that age-old objective, *citizenship*, which until the very recent efforts of social science curriculum-making has been relatively intact, not broken down in terms of actual concrete attitudes and things to be done in becoming a good citizen.

Methods used in determining social objectives may be both indirect and direct. On the theory that knowledge may be obtained about what people do, if the details of what they read may be determined, informational analysis lists references to social problems in current literature and gets relative emphasis in frequency counts, as in the Lincoln School program of experimental curriculum-making.²⁴ Direct activity analyses are illustrated by the work of W. W. Charters and his associates in many fields,²⁵ and by the check by

²¹ Herbert Spencer, *Education*. New York: D. Appleton-Century Company, 1861, Chap. I.

²² D. H. Cooper and W. C. Reavis, "Changes in Emphasis on Educational Objectives for the Postwar Period as Viewed by School Superintendents," *Elementary School Journal*, 44: 510-516, 1944; W. C. Reavis and D. H. Cooper, "Postwar Changes in the Curriculum and in Instructional Materials," *Elementary School Journal*, 44: 583-589, 1944.

²³ David Snedden, *Sociological Determination of Objectives in Education*. Philadelphia: J. B. Lippincott Company, 1921.

²⁴ H. O. Rugg, "Problems of Contemporary Life as the Basis for Curriculum-Making in the Social Studies," Chapter XV in *The Social Studies in the Elementary and Secondary School*. Washington, D. C.: National Society for the Study of Education, 1923, Yearbook XX, Part II.

²⁵ W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929; W. W. Charters

G. M. Wilson of Boston University of the extent of the actual usage of number by Iowa parents.²⁶ Obviously, the most important part of any complete activity analysis which might be attempted will be the difficulty analysis, consisting of those items of things done in which are found errors. Most often school time and funds available will confine actual teaching to correction of these mistakes and clearing up of determined difficulties.²⁷

4. *Select course content tentatively.*

A direct comparison of specifics of content now taught and of materials which should be taught for social value will give information about desirable curriculum materials. For example, although the traditional elementary arithmetic course included items of too complex fractions and units on cube root, allegation, and similar spoor of the formal discipline theory,²⁸ modern studies such as that of H. E. Mitchell,²⁹ a student of E. L. Thorndike in Teachers College, Columbia University, find only the simplest essentials of number in actual use. Any item which has been taught, but which has no relationship at all to present social activities, would give place to material of modern social significance.

5. *Secure the judgment of specialists on course content.*

Local curriculum-makers cannot assume that they represent the best generalized thought with regard to any segment of the curriculum they may be revising. The widest point of view should be secured from the outstanding frontier thinker, the representative philosopher in the field of the problems in which they are working. If the method used is that of informational analysis, most often contribution to thought which has been made in the books published by this specialist or by a jury of his fellows is used. This was the procedure in the Lincoln School social studies program. Pearl Merriman, in her Procedure XI (see Chapter V) used the personal evaluation of a jury of fourteen reading specialists in checking "a list of thirty-nine systematic books on reading in terms of their judgment on the best discussion of"³⁰

and Isadore B. Whitley, *Analysis of Secretarial Duties and Traits*. Baltimore: Williams and Wilkins Company, 1924.

²⁶ G. M. Wilson, *A Survey of the Social and Business Usage of Arithmetic*. Contributions to Education. New York: Teachers College, Columbia University, 1919, No. 100.

²⁷ W. W. Charters and Edith Miller, *A Course of Study in Grammar Based Upon the Grammatical Errors of School Children in Kansas City, Missouri*. Kansas City, Mo.: University of Missouri, 1915, Education Bulletin No. 9.

²⁸ W. S. Monroe, "A Preliminary Report of an Investigation of the Economy of Time in Arithmetic," Chapter VII in *Second Report of the Committee on Minimum Essentials in Elementary School Subjects*. Washington, D. C.: National Society for the Study of Education, 1917, Yearbook XVI, Part I, pp. 111-127.

²⁹ H. E. Mitchell, "Some Social Demands on the Course of Study in Arithmetic," Chapter I in H. B. Wilson, et al., *Third Report of the Committee on Economy of Time in Education*. Washington, D. C.: National Society for the Study of Education, 1918, Yearbook XVII, Part I.

³⁰ Pearl Merriman, *The Professional Preparation of Teachers of Reading in*

the criteria, objectives, psychology, oral presentation, silent reading, and phonics.

Most important of all, philosophical judgment on ultimate objectives conceived and on the selection of course content are needed, so that groups under instruction may benefit from an advance of thought generation by generation. If the widest point of view is not obtained here, the curriculum is in danger of functioning only on the level of primitive education, where the objective is traditional and the main effect is a perpetuation of the information of the old men of the tribe. The past experience of the race should be found in course content chosen, but the philosopher is able to tell his associates how to think more widely and more inclusively in terms of more worth-while ultimate aims, so that there may be a steady improvement of culture. Then civilization will actually begin to take place.

6. *Organize the course.*

Course content should be arranged in terms of *sociological* implications discovered in terms of procedure 3 above. It should be organized also so that the educands, the individuals and groups to be taught, can profit by its administration. It is necessary to fit it to the actual status of the mind of the learner, as well as in terms of whatever logical relationships exist among its parts and segments. This means, first of all, *psychological* organization to conform to the abilities, capacity, and capabilities present in the individuals of the group. Any other arrangement of objectives, content, and outcomes will fail to motivate interest and effort, and will delay learning. It is held that, while this point of view should direct course of study arrangement, experience in each unit should include or should close with a *logical* summarization in order to further permanence of learning and certainty in delayed memory.

Organization of course content should include a statement of ultimate objectives, analyses of the details of curriculum activities, and a restatement of aims as desired outcomes.

7. *Try out the curriculum experimentally.*

When the course is ready for use, its value in terms of objectives set up should be determined by controlled experimentation (Chapter IX). To be most useful, representative experimental and equivalent groups should be used, and the criterion for achievement should be valid and inclusive. Programs of evaluation should be in terms of outcomes set up in the course as organized for tryout. "If, instead of representing merely specific abilities to be acquired, aims are conceived as a means of giving direction to the educative process, then outcomes observed in a given situation should reflect the extent and the direction in which a given experience or series of experiences has led the individual taught. Any evaluation of observed outcomes, therefore, must be in terms of the aims. In other words, evaluation does not

the Primary Grades of the Public Schools. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925.

consist merely in checking a completed process but in continuously appraising progress in the direction indicated by the accepted aims."³¹

8. *Revise the curriculum.*

On the basis of the findings of the experimental tryout, the curriculum segment should be carefully revised, using procedures 1 to 7 inclusive again. The efficient curriculum is never in final form. It should be subjected to constant study and improvement. Revision should be continuous. For example, in the program as carried on in Denver, many of the courses have now been published four or five times. This represents the number of cycles of study and revision to which they have been subjected.³²

C. The Program for Curriculum Revision

The age-old reason for change in educational offerings has been the satisfaction of social groups, motivated most often until very recently by philosophical or practical faith objectives. Reading has dominated the elementary school curriculum ever since the Protestant Reformation, when the individual first came into personal contact with his God through the Holy Word. Geography, one of the first results of "enrichment" of the curriculum, the commercial and industrial arts, and all the long list of college and lower school increments have been the children of more or less organized pressure groups, including modern state legislatures. These changes in the curriculum cannot be included under projects involving careful reflective thinking. They most often emerged from public attitudes; or, as in the strangle hold the classics formerly held, they received their authority from rationalization on the transfer values of formal discipline.

Modern attempts to raise curriculum revision to the level of creditable research are not very far back. Such loose organizations as that of the public schools and the state teachers college of Duluth, Minnesota, may be representative of them.³³ Now many advanced systems provide definitely for careful study of aims, content, and subsidiary problems.

The basic purpose of curriculum revision may be said, even today, to be closer conformity with public attitudes and specific desires. There is an attempt to bring the lay clientele closer to the problems

³¹ H. L. Caswell and D. S. Campbell, *Curriculum Development*. New York: American Book Company, 1935, p. 364.

³² A. L. Threlkeld, *Philosophy of the Denver Program of Curriculum Revision*. Denver: Denver Public Schools, 1927, Monograph No. 12, Chap. II.

³³ Ethel I. Salisbury and F. L. Whitney, *Report of Progress: English; Arithmetic; Geography, History, and Nature Study; Drawing and Industrial Art; and Music and Physical Education*. Duluth, Minn.: Duluth Public Schools, 1919; Ethel I. Salisbury, "The Construction of a Course of Study," *Educational Administration and Supervision*, 6: 381-387, 1920.

involved in course offerings, to educate the citizenship in proper attitudes and knowledge of the field of research engaged in, and thus to include the intelligent interest of the community in a better, more socially valuable curriculum. Perhaps in the most forward-looking school systems the next conscious purpose is an enhancement of the professional spirit of teachers and supervisors. In the older situation, the aim was first of all the making of new courses of study; but very probably this purpose would now be listed third in most cases. An illustration of a careful statement of aims is found in the Virginia state program for curriculum revision:

- (1) To improve classroom instruction in Virginia by encouraging teachers, through study of their own curriculum problems, to provide children with richer and more purposeful experience in the classroom.
- (2) To aid teachers in developing division courses of study especially adapted to their own needs.
- (3) To develop State courses of study.³⁴

Organization for curriculum revision is being more carefully thought out and becoming more definite.³⁵ Principles are beginning to appear for guidance in the setting up of curriculum research programs in district and state systems. L. T. Hopkins,³⁶ after practical experience in Denver, Long Beach, and elsewhere, suggests that any curriculum-making organization should: (1) involve all members of the educational staff; (2) include representative persons in the community; (3) center authority; (4) distinguish between responsible and advisory powers; (5) differentiate between administrative and productive duties; (6) involve outside specialists; and (7) have production as its chief aim, with the education of teachers and patrons as concomitant outcomes.

The high point of generalized thinking with regard to principles for curriculum organization is perhaps represented in an outstanding book in the field. These are listed as follows:

1. Sound principles of general administration should be applied at all times. This suggests that the administrative organization must be flexible, the line of authority must be clear, responsibility must be fixed, duties must be defined, and the usual administrative relationships observed.
2. The curriculum program should provide for a comprehensive change in the instructional program; that is, the administrative organization should extend throughout every school division in the school system.

³⁴ H. L. Caswell and D. S. Campbell, *Curriculum Development*. New York: American Book Company, 1935, p. 518.

³⁵ T. V. Goodrich and A. E. Folsom, "Frame of Reference for Curriculum Planning," *Elementary School Journal*, 44: 279-288, 1944.

³⁶ L. T. Hopkins, *Curriculum Principles and Practices*. Chicago: H. Sanborn and Company, 1929, pp. 291-292.

3. The curriculum program should provide for three types of participation: extensive participation by all teachers, supervisors, and administrators; intensive participation by small selected special groups during certain aspects of the program; and general participation by representative lay groups working on certain aspects of the program.

4. The curriculum program should provide early for the sensitizing of the teacher-group and lay groups to the need for curriculum revision, and, as the program progresses, revision should be made whereby these groups may be kept in constant contact with the program.

5. The curriculum program should provide for the guidance of the workers on each phase of the program. This implies the preparation of bulletins, materials, and the like by small selected groups or committees.

6. A type of administrative organization should be employed which will function as a regular part of the educational program of the school system, and which will insure the continuance of the curriculum program after the intensive phases of the work are completed.

7. The curriculum program should provide for a relatively long inaugural period of rather intense activity which culminates in a continuous program.³⁷

From the more or less amorphous types of the scattered attempts of yesterday to change course offerings, definite organization forms are now appearing. Former trial-and-error programs are being analyzed, and such mistakes are being recognized as scattered and indefinite responsibility, poor committee organization, waste of time and funds, too brief research study of crucial curriculum problems, too much emphasis on course publication, careless and unorganized installation, and so on.

L. T. Hopkins suggests that any organization for curriculum-making should take "into consideration the aims of the curriculum construction program, the criterion upon which the organization should be based, and the duties of each member of the school personnel and other individuals who must necessarily have contact with such a program."³⁸ His graphic plan shows the board of education and the superintendent of schools on the one hand and the educational staff and lay citizens on the other connected with definite lines of cooperation and responsibility. There are a curriculum director and a curriculum specialist working with the department of supervision and the department of research and directing the work of six types of committees: (1) aims, (2) production, (3) tryout, (4) installation, (5) continuous revision, and (6) special committees.

The organization for curriculum research in Virginia may be taken

³⁷ H. L. Caswell and D. S. Campbell, *Curriculum Development*. New York: American Book Company, 1935, pp. 485-486.

³⁸ L. T. Hopkins, *Curriculum Principles and Practices*. Chicago: H. Sanborn and Company, 1929, pp. 324-325.

as representative of good state plans.³⁹ Here the general state work was directed by the state superintendent of public instruction cooperating with advisory committees of educational leaders and of laymen. The divisional organization included higher education, textbooks and libraries, vocations, research and finance, and buildings and supplies. The state director of instruction worked with an editing committee, a reviewing committee, a principles and aims committee, and with general and special curriculum advisers, and supervisors of all types of educational effort. There were also state production committees for both elementary and secondary schools, a regional advisory committee, and a curriculum centers' executive committee. The local organizations for counties and cities included were each in charge of a division superintendent and chairman of curriculum, working with division and local product committees for elementary and secondary schools.

An example of a city school system organization for curriculum research is that of Pasadena, California.⁴⁰ Here there are general elementary and secondary curriculum committees, and a superintendent's curriculum council. This provides definitely for coordination and articulation of all course of study work. The general organization for revision of the secondary-school curriculum in public school systems is indicated in Table XXIX in terms of the agency having control. It is seen that the chief school executive, the superintendent, has charge in about one fifth of the situations analyzed, and that the high-school principal and assistant superintendent come next.

A serious handicap in early programs for the revision of the public school curriculum, whenever classroom-teacher participation was desired, was the ineffective attempt to add to the teacher's total load by committee work after school or on Saturday. The first system to provide for the release of teachers under contract was that of Denver, Colorado. Here, on the recommendation of the superintendent, the late J. H. Newlon, afterwards of Teachers College, Columbia University, the board of education set aside \$16,000 per year for supply teachers, as well as an adequate budget for expert supervision, consulting specialists ("engineers of education"), and so on.⁴¹ This pioneer policy has now been adopted by a number of other systems.

³⁹ Central State Curriculum Organization, *Organization for Virginia State Curriculum Program*. Richmond: State Board of Education, 1932, Bulletin No. 5.

⁴⁰ C. C. Trillingham, *The Organization and Administration of Curriculum Programs*. Los Angeles: University of Southern California, 1934.

⁴¹ A. L. Threlkeld, *The Denver Program of Curriculum Revision*. Denver: Denver Public Schools, 1927, Monograph No. 12.

TABLE XXIX
 FREQUENCY OF SCHOOL SYSTEMS IN WHICH CERTAIN AGENCIES
 HAVE DIRECTION OF CURRICULUM REVISION FOR
 THE SECONDARY SCHOOL, 1934 ^a

Agency	Frequency
1	2
1. Superintendent	35
2. Principal	27
3. Assistant superintendent	23
4. General committee	20
5. Administrative staff	15
6. Director of curriculum	10
7. Director of research	8
8. Supervisor	5
9. Department of instruction	3
10. Department heads	3
11. Board of superintendents	2
12. University staff	2
13. Director of educational and vocational guidance	1
Total	154

^a E. S. Lide, *Procedures in Curriculum Making*, National Survey of Secondary Education, Monograph No. 23, United States Office of Education, 1933.

With regard to programs of attack on the curriculum, at least two outstanding plans have developed. These are represented by the work in Denver, Colorado, and in Tulsa, Oklahoma. In the former situation, the policy has been a constant attack along the entire front, in which theoretically all segments of the curriculum are always under study and revision by many teacher committees. Each course of study receives the attention of a specific teacher group in general charge of a full-time curriculum director. At the proper time, outside specialists are called in to review the work of the committee and give advice. No course of study is ever in final form, and, to date, many of them have gone through several cycles of criticism, restatement, tryout, and publication. In Tulsa, the plan is to deal with one segment of the total curriculum each academic year. For example, during one year, reading was under study. Local committees were in charge of system supervisors. At the proper time, A. I. Gates of Teachers College, Columbia University, was called in for consultation; and during the following summer session the committee enrolled at Teachers College

for further work. Another year arithmetic was attacked. F. B. Knight was the special adviser, and summer work was at the State University of Iowa. Another year the social studies were dealt with, and Colorado State College of Education cooperated.

D. Reflective Thinking in Curriculum-Making

It has been seen that the essential element in the definition of the curriculum type of research in Section A is that of reflection. To what extent is this found among the eight procedures of curriculum-making (Section B)? If it does not characterize a representative number of them, the phrase *curriculum research* is a misnomer.

There is, of course, a feeling of need on the part of someone, or nothing would ever be done, and traditional curriculum offerings would be finally accepted unchanged. But it may be that, as in many human enterprises, mixed motives are present. The basic purpose of curriculum revision is childhood and later adult welfare, but it may be that lay influences or even educator aims are tainted by self-seeking attitudes. As an illustration, note the long delay on the part of the publishing industry in bringing out in textbook form the content of the *Social Science Pamphlets*, coming out of the Lincoln School project.⁴² Further, pressure groups are not always sincerely altruistic in their suggestions for additions to the content of the curriculum.

This feeling of need is present as an initiating influence; but the check of present offerings and the analysis of related research ought to result in a clear conception of the problem situation present. And its final definition should emerge during any social or economic checks made in a search for objectives. A hypothetical attitude is taken when present offerings are compared with what ought to be taught, in order to select desirable content. It will, of course, be maintained until after adequate experimental tryout has given it some element of certainty. Then tentatively held generalized conclusions emerge; but an open-minded attitude results in repeated cycles of revision and experimental tryout.

A cross-check of curriculum procedures with methods and types of research discussed in Chapters VII to XIII discloses relationship also. The attitude of descriptive research looking for normative generalizations may be found in the analysis of present offerings and of previous research reports, as well as in surveys for objectives. The historical method should be applied to evaluation of past research activities in the field of problems dealt with in the curriculum-making project, as

⁴² H. O. Rugg, "A Preface to the Reconstruction of the American School Curriculum," *Teachers College Record*, 27: 600-616, 1926.

well as to a discovery of time trends in the content and teaching methods of curriculum offerings in the local situation. True experimentation characterizes the controlled tryout of organized courses prepared. The conception of large, ultimate objectives should be on the level of philosophical thinking to be at all worth while for guidance in the selection of the specifics of course content; and the criterion of the jury of specialists or the one outstanding frontier thinker raises the entire process of curriculum revision to a level of most inclusive generalization. The prognostic value of all generalized content emerging in the curriculum-making process, and in particular during actual teaching in the classroom, is of supreme importance. It is not so much the increment of factual content, which sticks in immediate and delayed memory, which is important. The highest test of the value of a curriculum in operation is in that body of generalized fact and attitude which results. Does experience in curriculum activities teach learners to make inferences, to recognize and apply principles, to develop character, to use scientific method, and to be interested and appreciative?⁴³ Obviously, any good curriculum is made from a sociological point of view. And, finally, the content may be presented in the written course on the creative level, as an original piece of literature. This outcome was noted in Chapter XIII, in the case of Estella J. Bennett's master's research project, which was written in supplementary-reading form for junior high school comprehension.⁴⁴

The curriculum-making program may be conducted in terms of creditable research projects of reflective thinking. The actual value of the product, the course ready for tryout, will depend very largely on what proportion of all things done can be found on this level of thought. This will be shown in the next section.

E. Evaluation of Types of Curriculum Research

As intimated in Section A, ever since the introduction of the individual to the reading method of soul salvation during the Protestant Reformation, the typical classroom activity has been getting information from the printed page. In European schools, there was some shift from this; the teacher became the book, reading and reporting its contents to the class. But in America, in spite of outstanding exceptions in experimental schools and leading city systems, a visitor will find

⁴³ R. W. Tyler, *et al.*, *Service Studies in Higher Education*. Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1932, Monograph No. 15.

⁴⁴ Estella J. Bennett, *A Study of Dakota Territory of 1861 and Wyoming South of the Forty-third Parallel*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1926.

children most often seated with book in hand engaged in silent reading. The book is the course of study. Its content determines very largely the total curriculum.

Informal attempts to evaluate the curriculum in book form are as old as *The New England Primer* or any successors it may have had. But organized studies of how to judge textbook value objectively come later. One of the earliest was in Rockford, Illinois, where the superintendent took frequency of words in the printed vocabularies in the back of primers as a basis for judgment of worth. About the same time, a committee of the seven first grade teachers and their principal in the Monroe Elementary School, Minneapolis, undertook a "serious research bearing upon courses of study for entering pupils" in the city public schools. Their method involved analyses of the content of the nine readers constituting the minimum reading requirement for first grade pupils. The five criteria of excellence for the books used were: (1) total number of words, (2) frequent repetition of the greatest number of words, (3) "the interest shown by the children as aroused by such items as cover design, illustrations, end sheets, character of type, and general artistic make-up from a childlike viewpoint," (4) the English element, including sentence construction and story continuity, (5) literary value in terms of the feeling element, which conforms to Arlo Bates' definition of literature as "adequate expression of genuine and typical emotion."⁴⁵

This pioneer attempt to set up criteria for one segment of the curriculum has been followed by many studies, characterized by more or less research and resulting very often in score cards with definitely listed rubrics of excellence. These have been reviewed in the Thirtieth Yearbook of the National Society for the Study of Education.⁴⁶ The points of value found among these reports have to do with the needs of the teacher and the pupil, the prestige of author and publisher, the volume of use as reported by the sales, as well as the physical make-up of the book itself. It is suggested that the textbook should be fitted to the character, intelligence, and status of professional education of the teacher who is to use it. It is held that it should conform to pupil interest, comprehension, and feeling by care about content, word use and difficulty, grade placement, accuracy, use of detail,

⁴⁵ F. L. Whitney, "Measuring the Value of First Grade Readers," *American School Board Journal*, 53: 24, 77, 78, 1916; Arlo Bates, *Talks on the Study of Literature*. Boston: Houghton Mifflin Company, 1897; I. R. Waterman and I. R. Melbo, "A Plan of Procedure for the Evaluation of Textbooks in Reading," *Elementary School Journal*, 35: 662-674, 1935.

⁴⁶ J. B. Edmonson, et al., *The Textbook in American Education*. Chicago: National Society for the Study of Education, 1931, Yearbook XXX, Part II.

method suggestion, organization of material, and similar psychological matters. It is held that decisions on value based on author or publisher prestige and volume of sales should be made with great care; and that basic criticism of the book itself should have to do with such problems as mechanical make-up, size, binding, type, color and finish of paper, letter spacing, length of line, legibility, and general appearance.

Since the publication of this yearbook, a dozen or more studies of textbook evaluation have been reported.⁴⁷ These have pointed out the limitations of the score card and have made concrete suggestions for criteria in evaluating textbooks in mathematics, language, science, history, geography, and home economics.

The next level of evaluation has to do with analyses of published courses of study. One of the earliest, that of C. M. Reineohl,⁴⁸ dealt with state rural elementary curriculums. Later, Henry Harap, then of the Cleveland School of Education, analyzed public school courses published during the years 1929-1931. Later still, informal appraisals of course-of-study bulletins in science, music, art, mathematics, English, foreign languages, and social science were made in connection with the National Survey of Secondary Education.⁴⁹

One of the most carefully organized programs of evaluation of published courses of studies is that set up at Teachers College, Columbia University, in 1924.⁵⁰ It has been managed by a faculty advisory committee of eight and a larger general faculty group. Practically 9,000 elementary school courses were rated on criteria determined by an analysis of the strength or weakness of 498 bulletins. One hundred twenty-one graduate students acted as judges, no single course having less than three judgments. The research project resulted in the selection of the 200 best courses and in score cards (not scaled) for all types of public school elementary courses, each with five general

⁴⁷ Margaret A. Norton, *et al.*, Chapter III in "The Curriculum," *Review of Educational Research*, 4: 194-198, 1934.

⁴⁸ C. M. Reineohl, *Analytical Survey of State Courses of Study for Rural Elementary Schools*. Washington, D. C.: United States Office of Education, 1922, Bulletin No. 42, 1922.

⁴⁹ Henry Harap and A. J. Bayne, "A Critical Survey of Public-School Courses of Study Published 1929 to 1931," *Journal of Educational Research*, 26: 46-55, 105-109, 1932; W. L. Beauchamp, *Instruction in Science*. National Survey of Secondary Education. Washington, D. C.: United States Office of Education, 1933, Monograph No. 22, Bulletin No. 17, 1933.

⁵⁰ Florence B. Stratemeyer and H. B. Bruner, *Rating Elementary School Courses of Study: A Report of the Results Secured from Rating Nine Thousand Elementary School Courses of Study*. New York: Bureau of Publications, Columbia University, 1926; H. B. Bruner, "Criteria for Evaluating Course-of-Study Materials," *Teachers College Record*, 39: 107 ff, 1937.

headings: (1) recognition of objectives, (2) organization of subject matter, (3) recognition of and adaptation to pupil needs, (4) adaptation to teacher needs, and (5) the course of study itself, including mechanical make-up.

More valuable still than bulletin analysis is evaluation of courses of study actually installed. This has been in terms of many criteria for results. The reaction of the educand was studied informally by C. H. Nettels by asking 100 high school chemistry pupils in Los Angeles to state strong and weak points of the science course. More carefully, W. E. Peik asked the graduates of the School of Education, University of Minnesota, to evaluate check lists of topics obtained by an analysis of education courses they had taken. The subsequent experience of graduates, for judgment of the worth of courses taken, was checked by Lillian F. Rivers by obtaining data on things done by high-school and junior-college commercial students; and by F. L. Whitney in terms of the relationship between college subjects taken in Colorado State College of Education and subjects actually taught after graduation. The expert judgment of college instructors and of specialists in another professional field was used by collaborators in the national land-grant school survey and by the Society for the Promotion of Engineering Education to evaluate course offerings. Pupil achievement in school subjects, as a measure of the value of the activity curriculum in Lincoln School, Teachers College, Columbia University, was determined by L. T. Hopkins. More general, subtle values, as criteria for course excellence, were used by such studies as that reported in *Western Youth Meets Eastern Culture* and in the Ohio State University program of test-making for college courses discussed in a previous chapter.

Finally, perhaps the most obvious and it may be the most accurate method of course study evaluation is in terms of the reaction of the teacher to his classroom experience. Illustrations of this are the appraisal programs in Berkeley, California, and in Denver, Colorado.⁵¹

⁵¹ C. H. Nettels, "Pupils' Reactions to General Science Courses," *Los Angeles Educational Research Bulletin*, 11: 10-14, 1930; W. E. Peik, *The Professional Education of High School Teachers*. Minneapolis: University of Minnesota Press, 1930; Lillian F. Rivers, *An Evaluation of the Commercial Curriculum of the Fullerton Union High School and Junior College in Terms of the Subsequent Experiences of Graduates*. Unpublished Master's Thesis, University of Southern California, 1928; F. L. Whitney and John Milholland, "The Relationship of Teachers College Preparation to Subjects Taught after Graduation," *School and Society*, 37: 533-536, 1933; A. J. Klein, *Survey of Land-Grant Colleges and Universities*. Washington, D. C.: United States Office of Education, 1930, Vols. I, II, Bulletin No. 9, 1930; F. L. Bishop, *et al.*, *Report of the Investigation of Engineering Education, 1923-1929*. Pittsburgh: University of Pittsburgh, 1930; L. T. Hopkins, "Learning Essen-

In Berkeley, questionnaires were used with all elementary school teachers in the spring and in the fall of the school year. This was for the purpose of determining the activity element in the courses as taught and the effect on subject-matter learning. The program of course evaluation in Denver, Colorado, included teacher rating by the use of a general score card, as well as check lists for the various school subjects. The eleven points of criticism are indicated in this outline.

DENVER CURRICULUM APPRAISAL QUESTIONS

1. In your judgment does the part of the course you are rating make sufficient use (a) of the interests of boys, (b) of the interests of girls, (c) of the environment, (d) of opportunities for health education, and (e) of opportunities for moral education?

2. In your judgment does the part of the course you are rating make adequate provision for pupil activity, both individual and group, (a) in understanding and accepting definite goals, (b) in initiating plans to attain these goals, (c) in carrying out these plans, and (d) in judging the results?

3. In your judgment does the part of the course you are rating provide pupils of medium ability with work which (a) challenges their best efforts, (b) presents no insurmountable difficulties, (c) allows sufficient time for mastery of essentials, (d) contains sufficient concrete, illustrative material, (e) provides some practice in abstract thinking, (f) is easily adaptable to individual differences, and (g) is of such importance for these pupils that it should be included?

4. In your judgment does the part of the course you are rating provide pupils of limited ability with work which (a) challenges their efforts, (b) is within their ability, (c) allows sufficient time for mastery of essentials, (d) is rich in simple, concrete, illustrative material, (e) is easily adaptable to individual differences, and (f) is of such importance for these pupils that it should be included?

5. In your judgment does the part of the course you are rating provide pupils of superior ability with work which (a) challenges their best efforts, (b) provides much practice in abstract thinking, (c) is rich in suggestions that stimulate further activity, (d) is easily adaptable to individual differences, and (e) is of such importance for these pupils that it should be included?

6. In your judgment does the part of the course you are rating provide

tials in the Activity Curriculum," *Journal of Experimental Education*, 1: 298-303, 1933; Frances G. Sweeney, E. F. Barry, and A. E. Schoelkopf, *Western Youth Meets Eastern Culture*. New York: Teachers College, Columbia University, 1932; R. W. Tyler, et al., *Service Studies in Higher Education*. Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1932, Monograph No. 15; L. W. Smith, "A Quantitative Study of an Activity Program," *Elementary School Journal*, 33: 669-677, 1933; A. L. Threlkeld, *The Denver Program of Curriculum Revision*. Denver: Denver Public Schools, 1927, Monograph No. 12.

for desirable correlations (a) with other Denver courses of study in the same subject-matter field which have preceded or which will follow the given course, and (b) with other Denver courses of study in other subject-matter fields that pupils are studying at the same time as the given course?

7. In your judgment is there undesirable overlapping with other Denver courses of study (a) in the same subject-matter field, and (b) in other subject-matter fields?

8. In the part of the course you are rating have standards of attainment been given which are (a) so definite that they guide in the selection and organization of subject matter and in the choice of methods, (b) so stated that they show the degree of mastery expected from pupils of varying abilities, and (c) so placed that they can be used to advantage to check results?

9. In the part of the course you are rating is adequate opportunity given to the teacher to exercise initiative and judgment (a) in selecting subject matter, (b) in organizing subject matter, and (c) in choosing methods?

10. In your judgment does the course you are rating provide sufficient help for inexperienced teachers (a) by emphasizing the principles which underlie sound teaching procedures, (b) by suggesting methods for remedial work, (c) by indicating clearly the relative value of various units of subject matter, and (d) by suggesting the desirable time allotments for the different parts of the work?

11. Is the course you are rating (a) definite and clear in meaning and concise in statement, (b) presented in a form which makes it easily usable, (c) provided with an adequate table of contents, (d) provided with an adequate index, (e) provided with an adequate bibliography, and (f) provided with references to adequate, accessible reference material for pupils?

In addition to the scoring of textbooks and curriculum bulletins and the testing of courses of study actually in use, there have been a number of reports on the efficiency of total curriculum programs in nation, state, and local school districts. The national surveys of secondary education and of teacher education (Appendix IV) reported more or less definite checks on course offerings. The state school survey in Texas included a number of programs of evaluation of the public school curriculum. Volume IV is devoted to reports of the achievement of the pupils in testing programs set up, including comparisons of white, Mexican, and Negro children. Volume V includes judgments on the quality of instruction, based on many classroom observations, evaluation of the printed curriculum, and reactions of teachers and superintendents to the curriculum in use. Volume VIII has a chapter, "Some of the Results of the Teaching," which discusses such topics as reading for understanding, rate of reading, addition and division, arithmetical reasoning, spelling, geography, algebra, mental ability, size of school as a factor in efficiency, length of school year, and achievement in the rural schools. The city school curriculums of Chicago, Nashville, and

Buffalo have been appraised in connection with surveys conducted there. M. C. Prunty,⁵² then superintendent of city schools, evaluated the revised curriculum in Tulsa, Oklahoma, using the following results of a year's administration of the new courses as criteria of excellence: (1) the comparative accomplishments of pupils on standardized tests, (2) the apparent changes in educational attitudes of the instructional staff, (3) the reactions of parents whose children have experienced both the old and the new elementary school curriculum, and (4) the apparent effect of the administration of the new curriculum on pupil attendance.

The program of curriculum evaluation in Denver, Colorado, in addition to securing the teacher reaction already discussed, includes system-wide subject-matter testing. Strictly valid, locally made new-type tests are used, having reliability coefficients ranging from .57 to .97. Two types of reports of results and their interpretations are made to principals and teachers. The first is in terms of subject norms. The second gives relative difficulty of items, common errors, suggestions for remedial work, comments on teaching method, and similar useful information. As a concrete illustration of the curriculum-testing program, actual procedures in elementary school arithmetic are listed.⁵³

1. Content at first selected by chairman of committee, supervisors, and director of measurements; later by supervisors and director of measurements.
2. Tests at first prepared by chairman of committee, supervisors, and director of measurements; later by supervisors and director of measurements.
3. Tests checked by director of measurements, a principal, and a teacher.
4. Decision by schools whether or not they wished to give the tests.
5. Tests given by teachers.
6. Tests scored by teachers.
7. Scores tabulated by teachers as follows: (1) tabulation Number 1

⁵² P. J. Kruse, Helen Koch, and Rietta Simmons, *Texas Educational Achievement*. Texas Educational Survey. Texas Educational Survey Commission, 1925, Vol. IV, Parts I and II; Margaret E. Noonan and O. G. Brim, *Courses of Study and Instruction*. Texas Educational Survey. Texas Educational Survey Commission, 1924, Vol. V; G. A. Works, *General Report*. Texas Educational Survey. Texas Educational Survey Commission, 1925, Vol. VIII; J. H. Newlon and others, "The Curricula of the Chicago Schools," *Report of the Survey of the Schools of Chicago*. New York: Teachers College, Columbia University, 1932, Vol. III; F. P. Bachman and others, *Public Schools of Nashville, Tennessee: A Survey Report*. Nashville, Tenn.: George Peabody College for Teachers, 1931; Buffalo Municipal Research Bureau, *Report of the Buffalo School Survey*, 1931; M. C. Prunty, *An Evaluation of the Reconstructed Curriculum in Tulsa, Oklahoma*. Greeley, Colo.: Unpublished Doctor's Field Study, No. 3, Colorado State Teachers College, 1934.

⁵³ A. L. Threlkeld, *Denver Program of Curriculum Revision*. Denver: Denver Public Schools, 1927, Monograph No. 12, pp. 59-60.

scores distributed into five groups, (2) tabulation Number 2—(optional)—showing individual problems missed by each child, and (3) tabulation Number 3—per cent missing each problem by grades.

8. City tabulations made by director of measurements as follows: (1) medians, twenty-five percentiles, seventy-five percentiles for city, (2) percentile ranks for all tests, and (3) per cent missing each problem for the city by grades.

9. Report prepared showing tabulations of scores and norms, with analysis of difficulties and suggestions for remedial treatment.

10. Research Monograph Number Two prepared by listing the types of examples that are significant in the mechanical processes together with the mental processes involved in working them and citations to the pages in the course of study showing the methods of reteaching or remedial work.

11. Presentation of report and research monograph to principals of elementary schools.

12. Supervision of instruction, making use of facts discovered as the basis for work needed.

It is obvious that checks on the value of curriculums in use, such as those just listed, must suffer from the disability of immediacy. However adequate and valid the program to test learner achievement may be, it cannot be assumed that values attained are permanent. The form of the curve of forgetting is well known; but it has been shown that the less specific and more general the abilities acquired are, the longer they remain a part of personality, and that in the case of the ability to apply principles and interpret situations there is a continuous increase. Edgar Dale of Ohio State University suggests that, in addition to (1) inadequacy in curriculum evaluation found in most testing programs, there is (2) the question of the mobility of immature groups who have made certain specific preparation, as well as (3) the lack of utilization of educational preparation that has been provided.⁵⁴

It is sometimes assumed that a rapidly changing society should be reflected in more or less radical revision of curriculum content year by year, or mayhap day by day. On the contrary, there is very probably actual continuity in the meaning of many social concepts, which may furnish an element of stability in a well-organized curriculum, if the trend can be known. The tracing of these temporal permanencies has

⁵⁴ Edgar Dale, "Long-Time Tests in Curriculum Planning," *Educational Research Bulletin*, 14: 145-149, 1935; R. W. Tyler, "Permanence of Learning," *Journal of Higher Education*, 4: 204, 1933; H. M. Hamlin, "Residence in 1932 of Iowa High-School Graduates, 1921 to 1925," *Journal of Educational Research*, 27: 524-528, 1934; C. M. Whitlow, "Graduates of Smaller Schools," *Junior-Senior Clearing House*, 7: 112, 1932, and *The High-School Graduate and His School*. Unpublished Doctor's Field Study, No. 1, Colorado State Teachers College, 1934.

been a long-time interest of Ernest Horn and his students at the State University of Iowa. Study of the history of the meaning of certain English words has revealed many red threads of continuity in group thinking. The curriculum-maker should be certain to know and use these elements of content. They should furnish a core of material in the public school curriculum, which may obviate any assumed necessity for radical and complete change of content in revision programs.⁵⁵

The historian, we are told, by reason of his craft knows that change is the one constant in history. But if this is all he knows, he is not much of a historian. For history pictures not merely change but the tenacious persistence of customs, ideologies, prejudices, and native human characteristics, as well as of the basic elements in the geographical setting in which the human drama is played. One does not need to deny a large degree of stability in our civilization and in the elements that condition it in order to assign full value to the factor of change. In emphasizing relatively persistent elements, moreover, it is not necessary to establish their permanence for all time but only for a few years. For example, the average student graduates from high school at eighteen. Twenty to thirty additional years carry him well into the period of his active citizenship.⁵⁶

These and similar considerations point to the necessity for carefully set up, nationally organized continuity, or genetic, studies of the development of individuals and of groups, with checks of progress in terms, not only of specific objectives, but of inquiries to what extent philosophical viewpoints and large inclusive aims are being attained. For example, in the light of our age-old educational purpose "to make good citizens," to what extent has there been a change in one aspect of this large "faith objective"; that is, in the attitude of youth and maturity toward laws? Has this development been negative or positive? Studies such as that of English usage approach this criterion,

⁵⁵ Ernest Horn, "The Validity and Reliability of Adult Vocabulary Lists," *Elementary English Review*, 16: 133, 1939; J. A. H. Murray, editor, *A New English Dictionary on Historical Principles*. Oxford, Eng.: Clarendon Press, 1901-1928; William Craigie and J. R. Hulbert, *A Dictionary of American English on Historical Principles*. Chicago: University of Chicago Press, 1936-; Hugh R. Walpole, *Semantics: The Nature of Words and Their Meanings*. New York: W. W. Norton and Company, 1941.

⁵⁶ Ernest Horn, *Methods of Instruction in the Social Studies*. American Historical Association, Report of the Commission on the Social Studies, Part XV. New York: Charles Scribner's Sons, 1937, p. 111. Compare E. L. Thorndike, "In Defense of Facts," *Journal of Adult Education*, 7: 388, 1935; E. P. Cheyney, *Law in History and Other Essays*. New York: Alfred A. Knopf, 1927; J. H. Robinson, *The Human Comedy*. New York: Harper & Brothers, 1937.

but more general and more socially important values should be investigated also.⁵⁷

F. Criteria for Research in Curriculum-Making

Suggestions for definite criteria for curriculum-making should consider first of all the accepted processes of *reflective thinking*. Is there delimitation of problems to be attacked? Are hypothetical solutions subjected to the criticism of pertinent evidence and experimental try-out? Are generalizations carefully corroborated and examined for qualitative prognostic values? As already shown, efficient programs for curriculum revision and good procedures and techniques may and should conform to these criteria for normal mind activity. Other items of excellence, including desirable outcomes, might all be covered by the general dictum for ordered reasoning.

No attempt to improve the curriculum is effective without an early conception of *generalized objectives*. These should go beyond locally stated aims and include the recommendations of the one outstanding philosopher in the field or of a carefully selected jury of frontier thinkers. This point of view on course content under consideration ought to provide for outcomes of greater and greater social value over successive periods of human experience.

The scientific selection of *socially related content* is being accepted more sincerely as a purpose and is being actually attained in more curriculum-making projects year by year. As the prestige of classical content weakens and as wider understanding of the role of transfer in learning is attained, comparisons of specifics and units now found in classroom experience with what ought to be taught from the viewpoint of social and economic values are resulting in the dropping of content having traditional value alone and the substitution of curriculum activities that have been found to conform to things actually done during immaturity and adulthood.

Carefully conceived outcomes should appear early in the planning of curriculum revision procedures in order that their cooperative role as objectives for learning processes set up may be effective. This may be begun during the determination of objectives; but in particular, when content is being organized for actual experimental tryout, specific aims listed should be restated as related outcomes. For example, if a purpose is to do long division, the outcome sought may be the ability to use the technique of long division in problem solution. Outcomes

⁵⁷ P. L. Essert, *Curriculum Content for Teaching Obedience and Respect for Law*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930; S. A. Leonard, *Current English Usage*. Chicago: Inland Press, 1932.

may, of course, be found on many levels of generality and be conceived as skills, knowledges, habits, attitudes, ideals, or appreciations.

The *objective evaluation of outcomes* is obviously a correlative necessity to their conception. This should come as a result of the controlled equivalent-groups experiment set up for the tryout of courses ready for installation. Of course, all of the criteria for scientific experimentation apply. Perhaps the most important of all has to do with the measurement program, during which valid and reliable locally made new-type tests should be used. A recent suggestion is that evaluation should not be conceived of as a procedure extraneous to the curriculum itself, carried on by separate critical agencies.

Instead, it is a function of the curriculum, interacting with each element of it at all points. Thus considered, evaluation occurs continuously as the curriculum develops and is concerned with every aspect of it. There are, however, three important aspects of a program of evaluation that require special attention: (1) It should provide pupils the means of evaluating their own activities; (2) it should provide the teacher a basis for planning the activities of pupils and for continuous evaluation of the results; and (3) it should provide a basis for constant revision of the curriculum.⁵⁸

Proper installation of the new course of study is necessarily a part of the total program of revision. L. T. Hopkins⁵⁹ recommends that continuity of effect be attained in curriculum work in any school system by giving the responsibility for production, installation, and repeated revision to the curriculum-research staff. He cites the system of Denver as formerly an illustration of division of responsibility, where the research office took charge of installation. As there has been, since then, a combined Department of Research and Curriculum, this cannot happen now. In Long Beach, California, from the beginning, the entire responsibility for curriculum revision is taken by the curriculum director working with L. T. Hopkins. In Denver, a selected elementary school was originally designated for course of study installation for tryout. Now schools are selected largely on the basis of the principal's ability and interest in and knowledge of the segment of the curriculum involved.

Basic to success in curriculum revision is a good statement of consciously known *assumptions on education* in general that maintain in the community, as well as *well-conceived general educational aims*. The former are those ultimate-ultimate objectives present in the collective mind of the district population, but at times not specifically recognized by curriculum-making authorities. For example, certain

⁵⁸ H. L. Caswell and D. S. Campbell, *Curriculum Development*. New York: American Book Company, 1935, p. 365.

⁵⁹ L. T. Hopkins, *Curriculum Principles and Practices*. Chicago: H. San-

revision proposals may partially fail because there is a general sentiment for or against such underlying philosophies as the responsibility of all for the education of all immature citizens irrespective of family status, assumptions about the optimum length of the educative experience for all learners, for example, to include or not to include higher and adult education, and similar general points of view that should be considered carefully before definite proposals for curriculum changes are made. General educational aims are only of slightly less importance in curriculum planning than is this basic group philosophy. These are generalized objectives such as "good citizenship" that summate the total of units and specifics of content and are themselves criteria for actual things taught. They are of supreme importance in curriculum-making, as they dictate the direction of all efforts toward improvement and thus are determiners for outcomes. They should be accepted in any research program after decisions on intrinsic and social values have been made. They ask about such things as tradition, utility, discipline, preparation, persistency, relation difficulty, pupil, community, and adult needs, and the like.

The curriculum-research program should also be in terms of carefully stated and *valid subject aims*. The two functions of a subject aim are given by L. T. Hopkins as (1) sociological and (2) psychological. "The former has to do with the selection of content to achieve the aim, and the latter is intrinsically associated with the selection of the method to be employed in teaching the content." He suggests that aims should be so practical as to motivate learners, specific in terms of definite subject matter and mental processes involved, and attainable.

The research organization for curriculum research should work as a continuous process in terms of definite *provision for repeated revision* of each course of study. Any more final attitude toward the product of curriculum research will not be in accord with the procedures of creditable reflective thinking, where concluding generalizations reached are always held tentative for reconsideration in the light of further evidence.

Detailed knowledge of the content of the curriculum to be revised should be had in terms of an *analysis of present offerings*. This needs no argument, but suggests that such a check should always precede the work of revision, even though it might be assumed that the old course activities are well known.

Any revision program should be based on *adequately conceived general principles of curriculum development*. This is illustrated in the Denver curriculum work in Chapter II of the 1927 statement entitled "Philosophy of the Denver Program of Curriculum Revision." The South Dakota revision program devoted the first publication to

an analysis of underlying principles. In the recent Virginia state curriculum project, six "Principles Governing Educational Aims and Processes" were published: (1) The school is an agency of society for its perpetuation and re-creation; (2) growth processes in individuals and in society are resultants of continuing interaction between individuals and society; (3) individuals differ in interests, abilities, attitudes, appreciations and understandings, habits and skills, and in capacity to learn; (4) growth is continuous; (5) all learning comes through experience; and (6) an individual tends to avoid experiences that annoy and to seek experiences that satisfy.⁶⁰

An *effective organization* for curriculum research is basic to success in revision projects. This will provide for both professional and lay participation, and in particular for the use of classroom teachers in committee work, as well as in installation and tryout. It will furnish adequate funds also for the cooperation of outside specialists, as they are needed. Table XXIX shows the general practice in the directorship of work on the secondary school curriculum. Illustrations of good organizations have already been given in this chapter.

Care in the *organization of course content* for actual tryout is essential. The child mind cannot react on an effective learning level otherwise. This arrangement of offerings, whether of the problem, the project, or the activity type, or in terms of subject-matter or interest units, should first be social, then psychological, and finally logical, as suggested in a previous section.

Provision should be made, when new courses of study are installed for tryout, not only to set up controlled groups for content evaluation, but to treat *teaching method experimentally* also. This means first of all that teacher procedures should appear as an integral part of each organized curriculum segment. These suggestions should be derived not only from the best practice of master teachers, but from any research reports available. They should be tentative, as is content also, and should be a part of the controlled experiment set up for curriculum evaluation.

In addition to these criteria for curriculum research, there are general requirements for effective reflective thinking, such as a detailed *check of present course content* and *skillful use of related research reports*. The necessity for these activities cannot be overemphasized, but they are neglected in some programs for revision. One of the

⁶⁰ A. L. Threlkeld, *Denver Program of Curriculum Revision*. Denver: Denver Public Schools, 1927, Monograph No. 12; H. G. Bruner, *General Aims and Guiding Principles of Education for the State of South Dakota*, Preliminary Reports on Approaches to and Theories Regarding Curriculum Construction. Pierre, South Dakota: Board of Education, 1930, Bulletin No. 1; State Board of Education, *Procedures for the Virginia State Curriculum Program*, Richmond, 1932, pp. 11-12.

most adequate curriculum projects in this respect is that set up by the state department of education in Michigan for tryout of an experimental teacher-education curriculum in the Central State Teachers College at Mount Pleasant, Michigan.⁶¹

TABLE XXX
A SCORE CARD FOR RESEARCH IN CURRICULUM-MAKING

Criteria	Scales		
	Low	Medium	High
I	2	3	4
1. Ordered reflective thinking	7.5	8.0	8.6
2. Generalized objectives	6.5	7.0	7.7
3. Socially related content	6.0	6.5	7.1
4. Carefully conceived outcomes	5.5	5.5	6.6
5. Objective evaluation of outcomes	5.0	5.0	6.2
6. Experimental treatment of method	4.5	5.0	5.6
7. Well-conceived educational aims	4.0	4.8	5.6
8. Valid subject aims	3.7	4.7	5.3
9. General principles of curriculum development	3.5	4.0	5.0
10. Local assumptions	3.3	4.0	4.7
11. Proper installation	3.0	3.7	4.4
12. Provision for cyclical revision	2.5	3.5	4.1
13. Effective organization for research	2.0	3.0	3.8
14. Organization of course content	1.5	2.5	3.4
15. Analysis of present offerings	1.0	2.0	3.0
16. Analysis of related research	0.8	1.5	2.4
17. Usable course form	0.5	1.0	1.6
Perfect score (total)	85.1		

Finally, *usable forms of the course* to be installed should be provided for both teachers and pupils. This has to do with good English usage, with organization, with mechanics, and similar matters. The purpose should be to put in understandable form the suggestions of the curriculum-making authority, so that the principal and the classroom teacher may profit definitely from the research program resulting in the organized course and so that educands may benefit from its use. In some systems, the tentatively organized course unit is first typed

⁶¹ K. L. Heaton, "Curriculum Designed to Meet Student Needs," *Centralight*, 6: 4, 1935.

for committee evaluation and for criticism by the outside frontier thinker or a jury of specialists. It is then mimeographed for the use of principals and teachers in installation and experimental tryout. At the close of each cycle of revision, it is printed in bulletin-series form for general sale.

These seventeen criteria are listed in score-card form in Table XXX. It is suggested that students consider the items critically, and revise them in terms of group judgment and the needs and conditions of specific projects undertaken. The items may then be rescaled by the method suggested in Chapter VII. Table XXXI gives an example of a student evaluation of a specific curriculum-research report.

TABLE XXXI
EVALUATION OF A CURRICULUM-RESEARCH REPORT ^a

Criteria	Scores	Criticism
1	2	3
1. Ordered reflective thinking.	8.0	1. The six steps were followed more sincerely than in the average master's research, although main emphasis was put upon inductive activities.
2. Generalized objectives	0.0	2. Objectives were specific, not philosophical.
3. Socially related content ...	7.1	3. All data were obtained directly from actual situations.
4. Carefully conceived outcomes	6.6	4. These were embodied in the items of actual activity discovered.
5. Objective evaluation of outcomes	0.0	5. The study was not carried to this point.
6. Experimental treatment of method	0.0	6. The study was not carried this far.
7. Well-conceived educational aims	0.0	7. These were not definitely stated.
8. Valid subject aims	0.0	8. These were not definitely stated.
9. General principles of curriculum development	5.0	9. These were embodied in plans and procedures.
10. Local assumptions	0.0	10. The study did not go this far.
11. Proper installation	0.0	11. The study did not go this far.
12. Provision for cyclical revision	0.0	12. The study did not go this far.
13. Effective organization for research	3.8	13. The student had the facilities of the Department of Educational Research, Colorado State College of Education,

TABLE XXXI (CONT.)

Criteria	Scores	Criticism
1	2	3
14. Organization of course content	0.0	and followed the details of the <i>Commonwealth Teacher-Training Study</i> , ^b then in process but not published.
15. Analysis of present offerings	1.0	14. This procedure was not reached.
16. Analysis of related research	2.4	15. This was only in terms of analysis and evaluation of previous research.
17. Usable course form	0.0	16. This was well done.
		17. Procedures were not carried to this point.
Total	33.9	
Possible total	85.1	

^a Virgie L. Nanney, *Analysis of the Duties and Difficulties of Superintendents of Small School Systems*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925.

^b W. W. Charters and Douglas Waples, *The Commonwealth Teacher-Training Study*. Chicago: University of Chicago Press, 1929.

Note: This piece of student research was good, as far as it went. A complete piece of curriculum revision was obviously impossible in a small master's thesis. Of the eight possible procedures in curriculum research (Section B) only 2, 3, and 4 were carried through.

It is, of course, desirable to use the score cards for descriptive, historical, and experimental research (Chapters VII to IX), also in evaluating curriculum-research reports dealing in particular with procedures involving these methods. For example, in the attempts to revise the teacher-college course in oral English by Gladys C. Bell and Abigail Casey, the first study, consisting of a catalog check of existing courses, used the technique of documentary analysis and may be evaluated by the use of Table XII, Chapter VII. Such historical studies as that of Harold Rugg in the work of the Committee on Curriculum-Making of the National Society for the Study of Education and B. A. Hinsdale's account of the work of Horace Mann may be scored by the use of Table XIV, Chapter VIII. And such experiments as that of E. R. Downing in scientific method may be checked with the list of criteria in Table XVII, Chapter IX.⁶²

⁶² Gladys C. Bell, *An Investigation of the Oral English Courses in the Teach-*

G. Summary

Research in curriculum-making is needed because of the lag of tradition in content and method, as well as because of a rather general disregard for actual activity objectives, overemphasis of factual information, and survival of an attitude of dependence on formal discipline alone.

Curriculum research isolates problems of course content, organization, and teacher procedure; sets up hypothetical solutions; and obtains experimental evidence on their value.

The procedures and techniques of curriculum-making have developed from the level of tradition and individual opinion toward scientific reflective thinking. Beginning with the social studies project at Lincoln School, Teachers College, Columbia University, many curriculum-revision centers have attacked problems of course-making in terms of creditable research procedures. Rather general agreement is found now on the items of things to be done, which include: (1) a check of present offerings, (2) an analysis of related research reports, (3) determination of social objectives, (4) tentative selection of course content, (5) judgment of specialists on the final selection of content, (6) sociological, psychological, and logical organization of the course, (7) its experimental tryout, and (8) cyclical revision.

Programs for curriculum revision are becoming more carefully conceived and more scientifically set up. Principles for guidance in national, state, and local projects are beginning to appear and are illustrated in such school units as Virginia, Pasadena, Denver, and Tulsa.

Creditable curriculum research may be analyzed in terms of the Dewey-Kelley steps in reflective thinking to include recognition of a feeling of need for course revision, the isolation of specific problems, experimental examination of hypothetical solutions, and qualitative evaluation of generalization emerging for prognosis.

Attempts to evaluate curriculum offerings have developed from the dominance of the church, through more or less unthinking supervision by the school clientele, to organized programs of score-card checking of textbooks and course of study bulletins, and more recent and more scientific investigations of the social and economic worth of course installations and school system curriculums. To date, these have been characterized most often by measures of immediacy rather than by

ers Colleges and Normal Schools of the United States. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925; Abigail Casey, *A Teachers College Course of Study in Oral English for Junior High School and Senior High School Teachers.* Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925; Harold Rugg, "A Century of Curriculum-Construction in American Schools," *The Foundations and Technique of Curriculum-Construction.* Washington, D. C.: National Society for the Study of Education, 1926,

long-time genetic studies of the effect of education on the development of individuals, groups, and communities.

Criteria for the value of curriculum research include ordered reflective thinking, generalized objectives, socially related content, carefully conceived outcomes, objective evaluation of outcomes, experimental treatment of method, well-conceived educational aims, valid subject aims, general principles of curriculum development, local assumptions, proper installation, provision for cyclical revision, effective organization for research, organization of course content, analysis of present offerings, analysis of related research, and usable form for the course.

H. Research Exercises

1. Tabulate in a frequency distribution the analyses of actual curriculum-revision procedures given in Section B and compare them with a similar table of proposals for good procedures and techniques in educational research in general.

2. When is curriculum revision not research? Illustrate.⁶³

3. Is theory ahead of practice in curriculum-making? Illustrate.

4. Should curriculum activities prepare for childhood or for adulthood? Justify your answer.⁶⁴

5. How may the minimum essentials in public school curriculums be determined? Illustrate.⁶⁵

6. Is factual information necessary for the learning of attitudes and generalized abilities? Illustrate.

7. What proportion of curriculum content and teacher procedure in a selected modern public school curriculum is dependent on the theory of transfer?

Yearbook XXVI, Part I, Section I, pp. 2-116; B. A. Hinsdale, *Horace Mann and the Common School Revival in the United States*. New York: Charles Scribner's Sons, 1898; E. R. Downing, "Does Science Teach Scientific Thinking?" *Science Education*, 17: 87-89, 1933.

⁶³ Merle Prunty, "Evaluating Curriculum Reconstruction," *School Executive*, 15: 234-239, 1936.

⁶⁴ Paul McKee, "Education for Present or Future Needs?" *The Teachers Journal and Abstract*, 3: 318-324, 1928.

⁶⁵ H. B. Wilson, et al., *Minimum Essentials in Elementary School Subjects*. Washington, D. C.: National Society for the Study of Education, 1915, Yearbook XIV, Part I; G. M. Wilson, et al., *Elimination of Obsolete and Useless Topics and Materials from the Common Branches*. Iowa City, Iowa: Iowa State Teachers' Association, 1915, and *Elimination of Obsolete and Useless Topics and Materials from the Common Branches: The Positive Program*. Iowa City, Iowa: Iowa State Teachers' Association, 1916; H. B. Wilson and others, *Second Report of the Committee on Minimal Essentials in Elementary-School Subjects*. Washington, D. C.: National Society for the Study of Education, 1917, Yearbook XVI, Part I; *Third Report of the Committee on Economy of Time in Education*. Washington, D. C.: National Society for the Study of Education, 1918, Yearbook XVII, Part I; and *Fourth Report of the Committee*

8. What proportion of traditional content, not justified from the viewpoint of social values, is found in an analysis of the curriculum of a selected modern public school system?

9. May curriculum revision be effectively carried on in small-town public school situations? Illustrate specifically.⁶⁶

10. May actual life activities be determined by analyses of reading activities? Illustrate.

11. What are the relationships among (a) the ultimate-ultimate objective, (b) the ultimate objective, and (c) proximate objectives in curriculum-making? Illustrate.⁶⁷

12. Distinguish between objectives and outcomes in curriculum revision. Illustrate.

13. Characterize a valid and reliable program of measurement to be used in curriculum evaluation. Illustrate.

14. Give an illustration of the statement of a "faith objective" in a printed course of study. How might this have been transmuted to the level of a functional objective?

15. Give a specific illustration of public school curriculum-making by a state legislature.

16. Give a specific illustration of public school curriculum-making by a social pressure group.

17. Report, in the case of a selected public school curriculum, to what extent the textbook is the course of study.

18. Set up an ideal program of long-time curriculum evaluation for a specific situation. Cite an existing program that comes nearest to this in value.

19. Distinguish between (a) consciously held basic assumptions with regard to public school education in a selected system and (b) general educational aims maintaining there.

20. Evaluate this program in terms of the seventeen criteria of Table XXX and of W. M. Proctor's "six principles."⁶⁸

on Economy of Time in Education. Washington, D. C.: National Society for the Study of Education, 1919, Yearbook XVIII, Part II.

⁶⁶ F. L. Whitney, *Report of the Superintendent of Schools, 1916-17.* Huron, South Dakota: Board of Education, 1917; G. M. Wilson, *Connorsville Course of Study in Mathematics for the Elementary Grades.* Contributions to Education. New York: Teachers College, Columbia University, 1919, No. 100; H. D. Eldridge, "Nine Significant Changes in Greeley's Curriculum," *Clearing House*, 11: 212-214, 1936; H. F. Srygley, "Curriculum Revision to Improve All Courses in Instruction," *Clearing House*, 5: 119-122, 1930; Central Curriculum Committee, *Explanatory Statement—Core Curriculum.* Eugene, Oreg.: Eugene Public Schools, 1939.

⁶⁷ J. C. Flanagan, "Research Techniques for Developing Objectives," *The Educational Record*, 28: 139-148, 1947.

⁶⁸ W. M. Proctor, "Six Principles of Curriculum Revision," *Nation's Schools*, 17: 16 ff, 1936.

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1. Mary F. Bannan, *A Comparison and Evaluation of Six Elementary Music Courses*. Unpublished Master of Arts Thesis, George Peabody College for Teachers, 1930.
2. Fred Baylis, *An Analysis of Courses in Physics in Teachers Colleges Representative of Better Practice*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1933.
3. B. H. Branscomb, *Teaching with Books: A Study of College Libraries*. Washington, D. C.: Association of American Colleges, 1940.
4. Dorothy Burdine, *The Vocabulary of Children's Letters*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1933.
5. O. W. Caldwell and G. E. Lundeen, "Changing Unfounded Beliefs: A Unit in Biology, *School Science and Mathematics*, 33: 394-413, 1933.
6. F. E. Deldosso, *A Concentrated Art Appreciation Program for Delaware Junior High Schools*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1932.
7. P. B. Diederich, *The Frequency of Latin Words and Their Endings*. Chicago: University of Chicago Press, 1939.
8. Ellen M. Freeman, "Textbook Trends in Plane Geometry," *School Review*, 40: 282-294, 1932.
9. L. C. Gilbert, "Experimental Investigation of a Flash-Card Method of Teaching Spelling," *Elementary School Journal*, 32: 337-351, 1932.
10. Isabelle K. Hart, "A Classification of Common Errors in Geography Made by Teachers and Pupils," *The Teaching of Geography*. Chicago: National Society for the Study of Education, 1933, Yearbook XXXII, pp. 479-482.
11. T. T. Herrick, "What is the Best Approach to a Curriculum Revision Study in a Twelve-grade System," *The Nation's Schools*, 43: No. 2, 8, 9, 1949.
12. L. T. Hopkins, et al., *Integration: Its Meaning and Application*. New York: D. Appleton-Century Company, 1937.
13. R. L. Hunt, *A Study of Factors Influencing the Public-School Curriculum of Kentucky*. Contributions to Education. Nashville, Tenn.: George Peabody College for Teachers, 1939, No. 254.
14. Joseph Justman, *Theories of Secondary Education in the United States*, Contributions to Education. New York: Teachers College, Columbia University, 1940, No. 814.
15. J. L. Kittle, *A Determination of Proper Content Material for a Music Survey Course*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1932.
16. Laura B. M. Krieger, *Prediction of Success in Professional Courses for Teachers*. New York: Teachers College, Columbia University, 1930.

17. J. L. Meriam, "An Activity Curriculum in a School of Mexican Children," *Journal of Experimental Education*, 1: 304-308, 1933.
18. Lois H. Meek, "Patterns of Growth During Adolescence with Implications for School Procedures," *Progressive Education*, 18: 41-45, 1941.
19. Maxwell Meyersohn, *Educational and Legal Aspects of In-Service Training and Certification of Teachers*. New York: John S. Swift Co., 1939.
20. J. K. Norton and Margaret A. Norton, *Foundations of Curriculum Building*. Boston: Ginn and Company, 1936.
21. M. L. Robertson, *A Basis for the Selection of Course Content in Elementary Science*. Unpublished Ph. D. Dissertation, University of Michigan, 1933.
22. G. B. Sain, *A Frequency Analysis of Musical Terms Found in Piano Compositions*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1933.
23. M. F. Seay and H. F. Clark, *The School Curriculum and Economic Improvement*. Bulletin of the Bureau of School Service. Lexington, Ky.: College of Education, University of Kentucky, 1940, Vol. XIII, No. 1.
24. Mary A. Sheehan, *A Study of the Social, Economic, and Educational Characteristics of 164 Slow-Moving Pupils in a City High School*. Rochester, N. Y.: School of Education, University of Rochester, 1941.
25. H. A. Sprague, *Decade of Progress in the Preparation of Secondary School Teachers: A Study of Curriculum Requirements in 55 State Teachers Colleges in 1928 and 1938*. Contributions to Education. New York: Teachers College, Columbia University, 1940, No. 794.
26. C. W. Washburne, et al., "The Grade Placement of Arithmetic Topics: A 'Committee of Seven' Investigation," Chapter XIII in *Report of the Society's Committee on Arithmetic*. Washington, D. C.: National Society for the Study of Education, 1930, Yearbook XXIX, pp. 641-678. Carleton Washbourne, "The Values, Limitations, and Applications of the Findings of the Committee of Seven," *Journal of Educational Research*, 29: 694-707, 1936; W. A. Brownell, "A Critique of the Committee of Seven's Investigations on the Grade Placement of Arithmetic Topics," *Elementary School Journal*, 38: 495-508, 1938; C. W. Washburne, "A Reply to Brownell's Critique of the Committee of Seven Experiments," *Elementary School Journal*, 29: 417-430, 1939.
27. F. L. Whitney, "Junior College Curriculum for Peace?" *Junior College Journal*, 13: 371, 372, 1943.
28. F. L. Whitney and L. T. Hopkins, *Industrial Arts*, Research Monograph, No. 4, Public Schools, Denver, 1928.
29. K. J. Wilbur, *Procedures in Curriculum Research*. Unpublished Master of Arts Thesis, University of Colorado, 1932.
30. H. S. Zim, *Science Interests and Activities of Adolescents*. New York: Ethical Culture Schools, 1940.

CHAPTER XV

The Classification of Research Material

THE NECESSITY for objectivity, accuracy, and intellectual honesty in the collection of evidence in step four of the Dewey-Kelley thinking process has been emphasized (Chapter VI). The point of view should be assumed that careful measurement with well-made tools is at the basis of success in this stage of the research procedure.¹ Further, the neophyte should not hesitate to enter this field of human experience. For a start, assuming native intelligence and an adequate academic background, a first course in educational statistics is sufficient (Chapter II). "To a large extent, the correct use of social statistics depends on common sense and simple arithmetic," . . . "The Arithmetic of Human Welfare."²

Further, in addition to statistics having "charm," tools of measurement are the *sine qua non* in our attempts to understand society and improve human welfare. "The Charms of Statistics—Some people hate the very name of statistics, but I find them full of beauty and interest. Wherever they are not brutalized, but delicately handled by the higher methods, and are warily interpreted, their power of dealing with complicated phenomena is extraordinary. They are the only tools by which an opening can be cut through the formidable thicket of difficulties that bars the path of those who pursue the Science of Man."³

The research student has selected his problem. The plan for his research has taken logical but tentative agendum form. He has decided on methods of procedure, and on techniques. And, after checking

¹ W. A. McCall, *Measurement*. New York: The Macmillan Company, 1939, Chap. I, "A Philosophy of Measurement," pp. 3-26.

² L. T. Hogben, *Mathematics for the Million: A Self-Education Based on the Social Background of Scientific Discovery*. New York: W. W. Norton and Company, 1938, pp. 609, 610, 618.

³ Francis Galton, *Natural Inheritance*. New York: The Macmillan Company, 1894, pp. 62, 63.

carefully all previous work in his field of endeavor, he has gone out after additional information pertinent to the ultimate objective, which guides his every research effort. Now the new data are beginning to appear. What they are depends upon the situation of his investigation and the methods and techniques of research he is using (Chapter VI).

For illustrative purposes let it be assumed that a descriptive research survey is being made in a small rural school,⁴ and that a part of the material which has been secured consists of the following mental ages of the fifty-three pupils: 6.0, 4.5, 5.3, 8.0, 10.0, 8.0, 5.3, 8.0, 9.1, 8.7, 9.1, 8.8, 9.4, 8.9, 10.4, 7.2, 11.8, 10.0, 10.3, 12.2, 9.7, 12.3, 12.5, 12.0, 11.8, 9.6, 11.9, 11.3, 14.0, 14.2, 9.9, 11.7, 13.5, 11.3, 11.6, 15.0, 13.1, 12.1, 18.5, 15.4, 15.2, 14.5, 14.5, 14.6, 17.2, 16.3, 20.0, 16.3, 13.5, 12.1, 13.9, 19.7, 15.5.

Now, it can be seen that this conglomeration should be dealt with in some way so that it may have meaning in the report that is to be made to the authorities asking for the survey. It will not be very effective in reporting these fifty-three mental ages to say, "The pupils in your school have native ability as represented by the intellectual ages, 6.0, 4.5, 5.3, 8.0, 10.0, 8.0, 5.3—" and all the rest! Some briefer method of referring to the group in terms of the functions measured in the investigation has to be employed. The data should be analyzed, organized, and classified.

It will be recognized that this statistical handling of the material, which eventuates in well-organized tables and informative figures (graphs), is on the next logical level above collection of data. Its purpose is to make possible clear exposition in discussion in the final research report (Chapter XVI). It should lead also to adequate interpretation, which extracts the true generalized meaning of both old and new data dealt with.

A. Levels of Reflective Generalization

Accepted devices and measures to use in this arrangement of data, so that they may be ready for the final report, will be presented in the following sections. Undoubtedly, the first thing to do with them is to attempt to find similarities, contrasts, relationships in the amorphous complex, "the big, buzzing, booming confusion," that they present. As in attempting to pick up a tangled pile of rope or a mass of garden hose, it is necessary to find some central or unitary portion of the material to get hold of. As already seen, one cannot sweep it all up and present it in any meaningful way in that condition.

⁴ E. E. Wright and F. L. Whitney, *A Survey of the Rustad Consolidated School: A Report of the Study of a Typical Situation in the Red River Valley*. Moorhead, Minnesota: State Teachers College, 1923, Bulletin Series 19, No. 2.

But the beginner in research has the experience of many preceding workers to guide him, and he will be unintelligent if he does not know about and use it. In attacking the analysis of a group of data like that given, the usual method is first to organize them in terms of the big differences found. For example, the common sense procedure will be to separate the scores into ten piles representing the grades in the school surveyed, then each pile into two smaller sex groups.

Perhaps organization stops at this point, and classification begins. But it is not very important to try to decide just when this transition takes place. The demand is to keep on analyzing and rearranging the data until finer and finer distinctions among them constantly appear to the research worker.

In fact, the problem consists in getting the data of the study into such form that thinking may be possible about the problems discovered in the situation dealt with. The analysis of the facts appearing in any field of inquiry should be carried to the point where data become more or less specific. Then their true nature is revealed in terms of relationships among them, and they are highly useful as evidence for or against the validity of hypotheses tentatively held.

The necessity for the classification of research material is, finally, to cause it to operate on successively higher and higher levels of generalization. The goal consists of the ultimate objective decided on at the beginning of the research (Chapter V). This is the largest generalization attainable in the field of inquiry with the research facilities available to the investigator at that time. Lower levels of generality are the proximate steps, the procedures, to be taken in attaining this final outcome. The natural sum total of activities in the research project thus constitutes the usual six steps of the process of reflective thinking (Chapter I). Following this order and method effects highest economy of effort and cost, and insures for the worker the most worth-while results.

B. Classification Forms

The experience of other research students is useful to the beginner at this point also. General agreement and convention have made a number of decisions that he should know about and that may furnish definite suggestions to him on what to do with the data of his research. They will take certain forms generally used, and a group of measures will be employed to aid in the discovery of true similarities and contrasts among them. For example, in the case of a type of material very commonly dealt with, the first thing to do is to start a two-way record of items of information, perhaps on a large 16 x 21 sheet of

squared, cross-section paper. This is primary classification on the lowest level of generalization above the isolated raw fact.

TABLE XXXII

THE AGE AT WHICH TEACHERS-COLLEGE STUDENTS
SELECT TEACHING AS THEIR LIFE WORK, 1935 ^a

Life age	Frequency
1	2
22-23	33
20-21	105
18-19	496
16-17	869
14-15	565
12-13	382
10-11	195
8- 9	90
6- 7	71
4- 5	20
Number	2826
Q_3	17.8
Median	16.2
Q_1	13.7
Q	2.1

^a J. D. Heilman, *Report on the Cooperative Testing Program of the Teachers-College Personnel Association*. Greeley, Colo.: Colorado State College of Education, 1935, p. 9.

Immediately, logical groupings are suggested by both the item titles and the column heads, and it is easy to put the related ideas, found in each column perhaps, into definite tabular⁵ or graphic⁶ form. This would be on a higher level of generality. Then it may be that the summation figures at the bottom of a group of tables are rather closely related and can be arranged in tabular form on the next level of generalization. How far this may be carried depends upon the nature of the material itself, but it is not hard to find illustrations of highly inclusive tables and figures resulting from very complex original situations. For example, note Tables XIII and XIV in a junior

⁵ Helen M. Walker and W. N. Durost, *Statistical Tables: Their Structure and Use*. New York: Teachers College, Columbia University, 1935.

⁶ J. H. Williams, *Graphic Methods in Education*. Boston: Houghton Mifflin Company, 1924.

college report, detailing the facts of enrollment in private and public institutions, and Table XV comparing the summaries of these facts with total figures.⁷

Illustrations of simple table and graph forms are given as Table XXXII and Figure 4. Each table and figure should constitute a logical unit of thought. Including its title, items, columns, and foot-

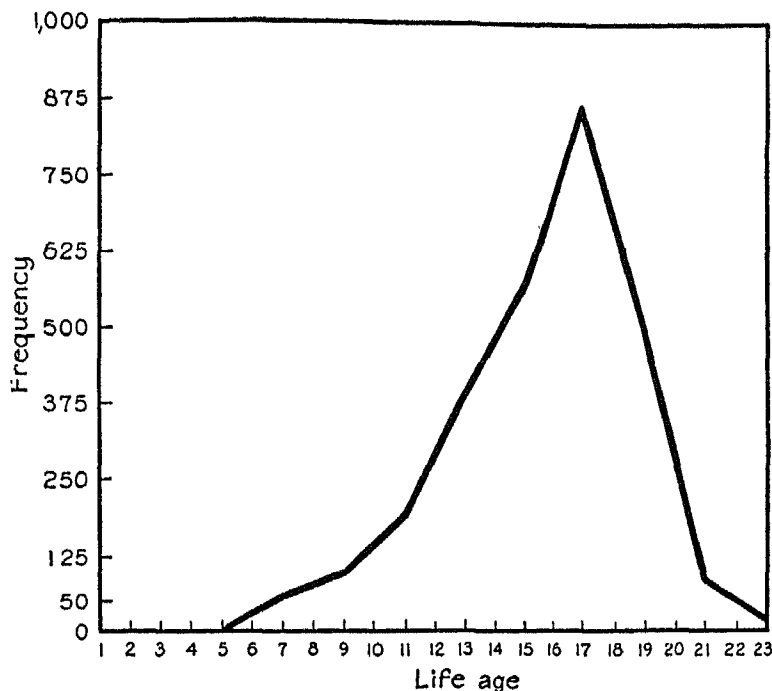


Figure 4. THE AGE AT WHICH TEACHERS-COLLEGE STUDENTS SELECT TEACHING AS THEIR LIFE WORK *

* J. D. Heilman, *Report on the Cooperative Testing Program of the Teachers-College Personnel Association*. Greeley, Colorado: Colorado State College of Education, 1935, p. 9.

notes, it will be a complete and independent group of information. It can be understood in detail, if isolated from the context in which it is found. In making tables and figures, brevity and simplicity are prime essentials. An attempt should be made not to include too much material in any one unit. Each table or figure should occupy one page

⁷ F. L. Whitney, *The Junior College in America*. Greeley, Colo.: Colorado Teachers College Education Series, 1929, No. 50, pp. 23-26.

alone in the typed report, and should be arranged on the page in accordance with well-known rules of art. The paper page and the mass of the table or figure should as a whole have the effect of the Greek Golden Oblong, as nearly as this can be approximated. Of course, a difficulty arises at once from the fact that every group of material so presented does not occupy an identical total of space on the page. Because of this, usually the best that can be done is to place the table or figure somewhat above the center of the page.

Both tables and figures are numbered consecutively in the order in which they appear in the final report. They are placed on the page next after that on which is found their first mention. The typist should be cautioned to be certain that lists of tables and figures coming directly after the preface of the completed thesis are exact copies of titles found in succeeding chapters in the body of the research report.

Tables and figures are used in the report of an investigation as aids to complete discussion and final adequate interpretation of the material reported. If they do not lend themselves to these aims, they should be excluded.

A figure (graph, chart, diagram) is a picture of facts found in the table. Ordinarily, it deals with only a related and unified group of all of the data in a table. Unless the table is very simple, it cannot include all of them without making the picture (figure) too complicated to be easily understood. For example, Figure 4 reproduces the frequencies found in Table XXXII. It is a good illustration of how essential data in a rather complicated table may be presented as a graphic unit to aid in their discussion and interpretation.

C. Statistical Measures

It is seen that a more or less unorganized mass of data is presented to the research student for classification when his material begins to take form. The problem is to manipulate these data so that a scientific process of thinking in the individual situation may be possible. It is a problem of analysis so that ultimate synthesis may follow. The whole group of facts cannot be dealt with *en masse* very happily or understandingly. Something should be done with them so that inherent qualities present may reveal themselves, so that relationships may appear, descriptive concepts emerge, and units and measures with meaningful names become available. Then problem solving may proceed in terms of inferences, hypotheses, theories, and larger and larger generalizations. "In short, we strove to maintain the attitude of experimental inquiry: confronting problems, collecting objective data, classifying and grouping them to discover similarities and dissimilarities, seeking recurrence and yet remaining skeptical of it, attempt-

ing to reduce errors of observation and judgment, generalizing and yet testing reliability.”⁸

This experimental attitude means, in addition to the use of conventional forms of classification, such as tables and figures, detailed knowledge and control of certain statistical concepts which make possible a revelation of the true nature of data dealt with. These measures are of two types: (a) those that help directly to describe the factual situation under observation, and (b) those that aid in the discovery of related data existing in past, present, and future and in bringing to light probable causes and effects. The first consist of point and spread measures. The measures of the second type have to do with correlation and reliability.

The following illustrations of the simpler measures useful in scientific thinking are presented for exposition and brief explanation.⁹

STATISTICAL CONCEPTS

I. Point measures.

A. Averages.

1. Mean.
2. Mode.
3. Median.

B. Percentiles.

1. Q_3 .
2. Q_1 .
3. Deciles.

II. Spread measures.

- A. Total range.
- B. Quartile deviation.
- C. Average deviation.
- D. Standard deviation.

III. Correlation measures.

A. Relationship.

1. Zero order.
2. Partial.
3. Multiple.

B. Prediction.

C. Causation.

IV. Measures of Reliability.

Point measures. To illustrate very simply with data recorded in definite terms of amount, suppose that the research worker has a small number of measures to handle, such as:

⁸ Harold Rugg, *That Men May Understand*. New York: Doubleday, Doran and Company, 1941, p. 220.

⁹ F. L. Whitney, *Statistics for Beginners in Education*. New York: D. Appleton-Century Company, 1929.

61, 34, 50, 74, 40, 50, 74, 50, 41, 18, 19, 62, 30.

He can deal with them by just mentally or orally saying all thirteen of them every time he wants to refer to them. But this would be very awkward indeed, and would not get him very far in the process of reflective thinking, as has already been shown. He should have some single handle, as it were, to grasp in order to get control of the group of data. The common sense inquiry will be, "What is the average of them?" Now, convention among statisticians usually reserves the term *average* to mean any acceptable expression of central tendency. The three most generally used are given in the preceding outline.

The *mean*, sometimes called the arithmetic mean, or the arithmetic average, is in common use. It is simply the sum of a group of figures divided by their number. For the thirteen in this small group above the mean is:

$$603 \div 13 = 46.4.$$

The *mode* is the most fashionable number in the group, the largest coterie just alike. It can be seen that these are the 50's. There are three of them, and they "set the fashion" for the group. Fifty is an expression of central tendency, an average. Some arrays of data have two modes (bimodal), and some many (multimodal). The following group of figures has two modes, 88 and 50:

88, 88, 88, 88, 70, 69, 60, 50, 50, 50, 45, 40.

The *median* is the middle measure in a group, when all are arranged in an array from largest to smallest:

74, 74, 62, 61, 50, 50, (50), 41, 40, 34, 30, 19, 18.

It is seen that 50 is the midfigure here, and may be roughly thought of as that expression of central tendency called the median (approximate).

Finding the exact midpoint of a group of data is not so simple if they are reported in terms of frequency in the class intervals of an array in a frequency distribution. For example, the first group above may be arranged as in Table XXXIII. It is seen that it is necessary first to establish the middle class interval in terms of the frequencies in column 2. Counting cumulative frequencies either up or down, it appears that the central tendency is in the 50-59 interval. If the individual scores are unknown, it is customary to assume that the three cases in this interval are evenly distributed in it and to calculate the central point measure by adding to the lower limit of the middle interval, 50, the average of the measures found in this interval up to

the center of the array $\left(\frac{6.5 - 6}{3}\right)$. The entire formula is given below. It is worked out for this simple problem.

$$\text{Median} = \frac{\text{Lower limit of the mid-interval}}{2} + \left(\frac{\frac{\text{Total frequency}}{2} - \text{Partial sum}}{\text{Frequency in the interval}} \times \text{Interval limit.} \right)$$

$$\text{Median} = 50 + \left(\frac{\frac{13}{2} - 6}{3} \times 10 \right) = 51.7.$$

TABLE XXXIII

THE DISTRIBUTION OF OTIS CLASSIFICATION TEST SCORES IN A GROUP OF THIRTEEN ELEMENTARY-SCHOOL PUPILS, 1949

Score intervals	Frequency	Cumulative frequency	Five percentiles	
			Points	Scores
1	2	3	4	5
70-79	2	13	100	74
60-69	2	11	75(Q_3)	63.8
50-59	3	9	50	51.7
40-49	2	6		
30-39	2	4	25(Q_1)	36.3
20-29	0	2		
10-19	2	2	0	18
Total	13			
Q_3	63.8			
Median	51.7			
Mean ^a	48.8			
Mode	50-59(55)			
Q_1	36.3			
Q	13.8			

^a The value of each score is taken to be the midpoint of the interval where it is found.

If the individual figures are not known, the nearest guess for the *mode* would be the midpoint of the interval that contains it, 55.

It will be seen that the amounts of the three measures of central tendency for this small group of data are not exactly the same. The most accurate of the three is the arithmetic mean. The most useful expression for central tendency is probably the median. Very large

extremes of either large or small scores do not affect it, as they do the mean.

The beginner in research should take care not to overrefine his data by too accurate statistical treatment beyond the roughness of his original measures. Just the mode is at times the best expression for central tendency, and often in reporting a median it should be called the *approximate* median. At times, one should give simply the two modes of a bimodal distribution. This caution is particularly pertinent when one is working in the field of the social studies. There original data cannot be as accurate as one would like. Any attempt to carry mathematical accuracy too far simply amounts to a statistical gesture. It is not a really necessary or desirable thing to do.

A very useful statistical concept at times has to do with the *percentiles* of a distribution. It will be recognized that the median, because it is the midpoint in an array, is the fiftieth percentile, because one half (50 per cent) of the cases are below it in value. Two other percentile points very frequently used are the seventy-fifth (Q_3) and the twenty-fifth (Q_1), having respectively three fourths and one fourth of the measures below them. In Table XXXIII, it will be seen that $Q_3=63.8$ and $Q_1=36.3$. Of course, the smallest score is at the zero percentile point, and the largest score is at the one-hundredth percentile point.

Any or all of the percentile points from 0 to 100 may be calculated. A favorite way is to get the ten-percentiles, or deciles, the tenth, twentieth, thirtieth, and so on. Each is obtained exactly as was the median in the illustrative problem. Note that the column of cumulative frequencies (column 3) simply helps in adding the partial sums used in each calculation. They are not a part of the table as it should be reported.

Spread measures. In addition to determining the points in an array of data, as an aid to interpretation of their meaning, it is very useful to have at hand facts about the type of distribution, about the curve of the surface of frequency. There are at least six deviation measures sometimes used for this purpose.

Of course, the simplest thing that can be said about the width, or spread, of an array is to give its *total range*, the distance between its smallest and its largest measures. It will be seen that in the group of thirteen scores just used this is:

$$74 - 18 = 56, \text{ total range.}$$

Then, one sometimes hears the expression, "the middle fifty per cent." This would be the measures from Q_3 to Q_1 . However, statistical practice usually takes one half of the distance between the upper

and lower limits of this middle half of all data as a second measure for the spread of a distribution. This is the *quartile deviation*. For example, in Table XXXIII, the quartile deviation (Q) is:

$$Q = \frac{Q_3 - Q_1}{2} = \frac{63.8 - 36.3}{2} = 13.8.$$

But a more valuable concept of the spread of scores in a distribution consists of their variation, or deviation, from the central tendency of the array. One of these measures of variation is the *average deviation*. For example, if the thirteen scores below are used, it is seen that the other figures deviate from the midscore, 50, as follows:

Scores: 74, 74, 62, 61, 50, 50, (50), 41, 40, 34, 30, 19, 18.

Deviations: 24, 24, 12, 11, 0, 0, 0, 9, 10, 16, 20, 31, 32.

When the average (mean) of these thirteen deviations is calculated, it is found that the average deviation (A. D.) is 14.5. But this measure is most often taken from the *mean* instead of from the median. As the obtained mean here is 46.4, the thirteen deviations are: 27.6, 27.6, 15.6, 14.6, 3.6, 3.6, 3.6, 5.4, 6.4, 12.4, 16.4, 27.4, 28.4. The average of them is 14.8, the accurate A. D. At times, the median instead of the mean of the deviations is taken. Then the unit of measure is, of course, the *median deviation*. The approximate median deviation here is seen to be 14.6.

But the most accurate measure of all for the variability of a group of scores is the *standard deviation*. This is very similar in theory to the average deviation, but there are two differences in their calculation. (a) The standard deviation is always taken from the mean, never from any other measure of average or central tendency. (b) The sign of each deviation figure is retained, but the minuses all finally become pluses, as $-3^2 = +9$, for example. The formula for the standard deviation is the square root of the mean of the sum of (Σ) the squared deviations, as follows:

$$\text{Standard deviation (S. D., or sigma)} = \sqrt{\frac{\Sigma D^2}{N}}$$

Taking these thirteen scores for illustration:

Scores = 74, 74, 62, 61, 50, 50, 50, 41, 40, 34, 30, 19, 18.

D = 27.6, 27.6, 15.6, 14.6, 3.6, 3.6, 3.6, -5.4, -6.4, -12.4, -16.4, -27.4, -28.4.

D^2 = 761.76, 761.76, 243.36, 213.16, 12.96, 12.96, 12.96, 29.16, 40.96, 153.76, 268.96, 750.76, 806.56.

ΣD^2 = 4069.08.

N = 13.

$$\frac{\Sigma D^2}{N} = 313.01.$$

$$\sqrt{\frac{\Sigma D^2}{N}} = 17.69, \text{ Standard deviation, S. D., or sigma } (\sigma).$$

Correlation measures. There is a series of very useful units that are often used in the classification of data to aid the thinking process in their discussion and interpretation. These are correlation measures. They furnish expressions of amount for the relationship of the variables, or factors, found operating in the field of inquiry in which the beginner in research may be at work. For example, if he is interested in the selection and educational guidance of teachers-college students, he can assume that there are a thousand and one variables, operating reciprocally in that realm of influence, which mutually affect each other and whose relative importance should be determined. Just a very few of these factors are native intelligence, ability in the mechanics of English composition, high-school marks, college grades, social and economic background, physique, specific aptitudes, and the like. In C. C. Leinbaum's master's study,¹⁰ the first four of the variables just listed were isolated and used. It is seen that he disregarded a great number of others that might have been included in his calculations.

Taking another field of correlation, that of the elementary school, it will be recognized that just as complex a situation has to be dealt with. For purposes of illustration of a coefficient of correlation of zero order, suppose that measures for two factors, arithmetic achievement and mental ability, have been obtained for seventeen 6A pupils, as given in columns 2 and 3 of Table XXXIV. If the first pupil had the largest scores in both variables, the second next largest in both, and so on to pupil 17, who had the smallest in both, the relationship, or correlation, of these two factors would be perfect and positive ($r = +1.00$). If the figures of column 3 were tipped upside down, so that pupil 1 had the largest arithmetic score but the smallest mental score, pupil 2 the next largest arithmetic score and the next to the smallest mental score, down to pupil 17, who would have the smallest arithmetic score but the largest mental score, then the correlation would again be perfect, but negative ($r = -1.00$). But, in a social realm like education, one never finds perfect relationships like this. The correlation is always somewhere between $+1.00$ and -1.00 , and it may be 0.00 , no relationship. In Table XXXIV, the actual relationship, zero order, is worked out at the bottom. It proves to be $+.628$

¹⁰ C. C. Leinbaum, *Predicting College Marks*. Greeley, Colo.: Unpublished Master of Arts Thesis, Colorado State Teachers College, 1928.

with a probable error (P. E.) of .108. That is, the chances are even that the actual coefficient lies between $+ .520$ and $+ .736$.

r	r	r	r
$- 1.00$	0.00	$+ 0.628$	$+ 1.00$

But, in this realm of influence, also, it is seen that there are many, many other factors operating. All of them affect to some degree the

TABLE XXXIV

MENTAL SCORES AND ARITHMETIC ACHIEVEMENT OF SEVENTEEN 6A PUPILS AND THE CALCULATION OF THEIR CORRELATION, ZERO ORDER, 1949

Pupils	Arithmetic scores	Mental test scores	Rank Order		Difference	Difference squared
			Arithmetic scores	Mental test scores		
1	2	3	4	5	6	7
1	95	68	1	1	0.0	0.00
2	94	65	2	2	0.0	0.00
3	90	52	3	8	5.0	25.00
4	85	16	4	16.5	12.5	156.25
5	84	58	5.5	3	2.5	6.25
6	84	53	5.5	6.5	1.0	1.00
7	81	53	7.5	6.5	1.0	1.00
8	81	47	7.5	9	1.5	2.25
9	80	37	11	12	1.0	1.00
10	80	54	11	4.5	6.5	42.25
11	80	54	11	4.5	6.5	42.25
12	80	37	11	12	1.0	1.00
13	80	21	11	14.5	3.5	12.25
14	76	37	14.5	12	2.5	6.25
15	76	46	14.5	10	4.5	20.25
16	70	21	16	14.5	1.5	2.25
17	65	16	17	16.5	0.5	0.25
Sum						319.50

$$\rho = 1 - \frac{6 \sum D^2}{N(N^2 - 1)} = 1 - \frac{6 \times 319.50}{17 \times 288} = .608 \pm .108$$

Transmuted to r , the coefficient is .628.

true relationship of the mentality of these 6A pupils to their arithmetic achievement. Examples of such variables are home background, physique, character traits, other school subjects, playground status, type of school building, time of day and of year, life age, kind of

school organization, quality of supervision, and so on, as well as all teacher factors, such as preparation, experience, salary, social status, chronological age, health, professional attitude, moral traits, and the like.

In order to determine the *true* relationship of (2) mentality to (1) arithmetic achievement (the criterion), the research worker would have to calculate, by means of the method of *partial correlation*, the relationship of these two factors with the influence of all other factors held constant ($r_{12 \cdot 34567 \dots n}$). To get expressions of amount for *all* factors in a realm of correlation like this would be a stupendous task. It has never been done. However, the educational research worker is obligated to isolate and hold constant as many related variables as he can with skill, time, funds, and energy available. To the extent that he does this, he will have finally an expression of the *true* correlation of these two factors.

Let us suppose that he has measures for only three variables, (3) silent reading ability in addition to the two previously given. Then, his calculation will result in a coefficient of the first order ($r_{12 \cdot 3}$), as he has held one factor constant while examining the relationship of another to the criterion. If he isolates another variable, (4) home background, for example, he will have a coefficient of the second order ($r_{12 \cdot 34}$) and will come nearer to the truth about the actual relationship obtaining.

By means of a change in method of calculation, it is possible also to find the relationship of a number of factors as a group to a criterion. This is the technique of *multiple correlation*. In the problem used for illustration, the coefficient would be expressed by the symbol $R_{1 \cdot 234}$ or $R_{1(234)}$, mentality, reading ability, and the home becoming independent variables.

Another very useful tool, which the beginner in research has ready at hand, if he has taken his courses in statistics, is the regression equation. This makes possible *prediction* of future values and events in the field of influence studied. C. C. Leinbaum's research, already reported, used this formula. By means of it one can make scientific guesses about the probable academic success of individual high-school graduates who are just beginning teachers-college work. This makes possible good advice to each student on the important question as to whether he shall undertake higher work of that kind and on the type of work he shall register for if it appears that he will be able to attain any creditable degree of success. It is an analytical tool for guidance.

Using the elementary school situation for illustration again, suppose

that each of the seventeen 6A pupils, when entering junior high school classes in the fall, brought with him a true statement of the prediction value, or weight, of three or four important factors in his school success (a regression equation). Written in equation form it might look like this:

$$\text{School success} = 75 \text{ Intelligence} + 20 \text{ Attendance} + 10 \text{ Home back-ground} + 3 \text{ Physique} + 40.$$

Then, the principal or the home room teachers could substitute for intelligence, attendance, home influence, and physical development values obtained from the study and testing of these factors in the case of each individual pupil. When each value as measured has been multiplied by its weight number (regression coefficient) and added, together with the constant (+40), there would result an expression of amount for the probable school success of the pupil in the junior high school.

Last of all, if the research worker has taken higher courses in statistics, he will be able to reason more objectively about probable *causation* relationships existent in any field of influence in which he may be working. Just common sense must be used first of all. For example, if it is found that two factors are mathematically correlated, (a) possibly there is no actual causal relationship at all, as it may be clear that they are not in the same realm of influence. If the actual cost of lamb chops in Denver rises with a scarcity of lambs in Australia, it cannot be assumed without further investigation that it is a case of cause and effect. (b) Then, if two factors actually in the same situation are found to be correlated, the question to be settled is: Which is cause and which effect? This has to be decided on the basis of any intimate knowledge the research worker has of the entire situation and all of the details of it. For example, in the case of an obtained correlation between the native intelligence and the arithmetic achievement of elementary pupils, it would be safe to say that academic performance (the criterion) is the dependent variable, the effect, and that intelligence, the independent variable, is one of a group of probable causes.

Very understandable units for the expression of relative degrees of casual relationship, such as this, are now being used in the field of education. These are the *path coefficient* and the *coefficient of determination*, both in terms of per cents. This makes them much more amenable to clear interpretation. Per cents may be understood by anyone, whereas the meaning of coefficients of correlation is closed

to some. The research worker should demand instruction on the derivation and the use of these measures in his statistics course.¹¹

Measures of reliability. Finally, the research worker must recognize the fact that all statistical measures are only approximations to the truth. The necessity in every case is to determine how far they depart from absolute accuracy. The student should have intimate knowledge of how to calculate the reliability of the mean, the median, the quartile deviation, the standard deviation, and of differences. His elementary course in statistics should furnish him with these measures and insure that he has the ability to select and use them with understanding in interpreting his findings.

D. Summary

Before it is possible to make an intelligent report of the findings of any research project involving objective measures, it is necessary to analyze the data obtained in terms of discovered foci of similarity and unity and to synthesize them on succeeding levels of generality. This makes good reflective thinking more possible, and eventuates more certainly in the attainment of ultimate objectives set up.

The beginner in research should have knowledge and control of the usual forms and measures employed by statistical workers in the fields of the natural and the social sciences. Usage and convention have prescribed certain ways of organizing and classifying data. These cannot be disregarded. They have to do with methods of representation in tables and figures and with certain point and spread units, as well as with the concepts of concomitant relationship (correlation), all in terms of the obtained facts of reliability.

E. Research Exercises

1. Take the fifty-three mental age scores obtained in the Rustad survey and given at the beginning of this chapter, and classify them in table and figure form like Table XXXII and Figure 4. Use mental age 2 as the width of each interval in column 1. This will make the work of the members of the class comparable.

2. Using the same data as in 1, determine A. D.

3. Using the same data as in 1, determine sigma.

¹¹ Sewall Wright, "Correlation and Causation," *Journal of Agricultural Research*, 20: 557-585, 1921; J. D. Heilman, "The Relative Influence Upon Educational Achievement of Some Hereditary and Environmental Factors," *Nature and Nurture*. Chicago: National Society for the Study of Education, 1928, Yearbook XXVII, Part II; J. E. Chadwick, *The Prediction of Success in Music*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

4. Use these arrays to report the coefficient of correlation, zero order (r_{23}).
5. Report the statistical reliability in each case.
6. Analyze ten educational studies that have employed mathematical methods and report on the extent of statistical preparation necessary. Is anything beyond algebra needed? Do graduate students know arithmetic?¹²

¹² H. W. Charlesworth, *A Study of the Subject-Matter Foundation of the Prospective Untrained Teacher of Arithmetic*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1928; H. C. Christofferson, "College Freshmen and Problem Solving in Arithmetic," *Journal of Educational Research*, 21: 15-20, 1930.

CHAPTER XVI

The Research Report

THE RESEARCH worker is obligated to report his study upon its completion; or it may be that he reports progress at a point where tentative conclusions have appeared, and he wishes to secure cooperation for further investigation. However, it is probably true that no research report is ever final. There is always additional evidence on hypotheses under consideration, which time, more funds, or further increments of skill, energy, and intelligence may bring to light. But the duty of the scientist at any point when publicity is decided upon is to give a completely detailed account of all of his experiences in the thinking process in which he has been engaged, to carry the reader with him from felt need through problem recognition, ordered guesses made, their experimental investigation, and tentative corroboration, to final evaluation in terms of prognostic certainty. The object is to give him a complete vicarious research experience.

A. The Report Outline

The organization of the final report has been consciously in mind from the beginning of the project in hand. It has been shown (Chapter V) that, if the report is a good account of research experience, it will be in terms of all things done during the carrying through of the investigation. The procedures, with the methods and techniques of each, become logical chapter heads and section titles. These have appeared in tentative form in the research plan, the agendum, made early in the whole process. When everything has been done and results are complete, the outline has itself been finally revised and is ready to be filled out in narrative and expository form.

The large logical divisions of a good outline for the report of a research study may be thought of as consisting of the following parts:

1. Title.
2. Preface (Acknowledgments).
3. Introduction (Research background and methods used).

4. Body chapters (Presentation of new data).
5. Final chapter (General summary, conclusions, recommendations, and so on).
6. Annotated bibliography.
7. Appendices.

It will be noticed that the chapter titles may be of two kinds, *routine* and *distinctive*. Both are justifiable, but they should not be employed in the wrong place. It may be preferable to use *Introduction* as a title for the first chapter and something like *General Summary* for the last, but the body chapters of the report should be under heads that will suggest their content. It is not meaningful to have titles such as *Results*, *Discussion*, and the like for these chapters.

The order of chapters just suggested is that usually found, but one often sees the first chapter of a report given to *Conclusions* and *Recommendations*,¹ or to an abstract of the report. This is a very good way to arrange the report of a survey ordered by a legislative committee. It makes the report more useful to that body.

In the case of the Virginia school survey,² two volumes were published, one giving a detailed report of the testing program carried through and its results, and the other addressed to the state legislature. This second volume contains, first of all, a fifty-page report of the education commission, beginning with twenty-three specific recommendations for legal changes and for administrative reorganization in both the state and local educational units. Note also a graduate master's report that is addressed to a group of special teachers and is put in distinctive service form, with a detailed statement of findings given first of all.³ The publication of a national survey of junior colleges,⁴ ordered by the Presidents' Association of the state institutions of higher education, was accompanied by a brief, popularly written bulletin⁵ containing essential findings and recommendations for legislation. This was distributed to the members of the state legislature and their constituents.

¹ Paul Monroe, *A Survey of the Public Educational System of Porto Rico*. New York: Bureau of Publications, Teachers College, Columbia University, 1926.

² A. J. Inglis, *Virginia Public Schools*. Yonkers, N. Y.: World Book Company, 1921, Parts I and II.

³ A. O. Colvin, *Commercial Education in the Secondary Schools of Colorado*. Greeley, Colo.: Department of Publications, Colorado State Teachers College, 1931.

⁴ F. L. Whitney, *The Junior College in America*. Colorado Teachers College Education Series. Greeley, Colo.: Colorado Teachers College, 1928, No. 5.

⁵ F. L. Whitney and J. H. Shaw, *The Junior College Movement: With Special Reference to Educational and Economic Conditions in Colorado*. Greeley, Colo.: Colorado State Teachers College, 1928.

The last agenda procedure (Chapter V), determining the organization of the final report, is not a simple matter, as it involves all of the thinking process of the project in hand. The list of chapter titles and section heads has to be considered as tentative and subject to possible revision, even after actual writing of the report is under way. For example, in the making of a finance textbook, a chapter on publicity was outlined; but after it was completed, it was found that its content was not "finance" enough to justify its use as a separate chapter unit. It was relegated in briefer, section form to a preceding chapter. But the original statement was found to be useful in a state publicity program in West Virginia.⁶

In order to criticize the final organization of the typical master's research report, the chapter heads and section titles of two theses are given here.

THE PROFESSIONAL PREPARATION OF
TEACHERS OF READING IN THE
PRIMARY GRADES ⁷

Introduction

1. Statement of the Problem.
2. The Thesis.
3. Method of Attack.
4. Brief Summary of Findings.

*Chapter I. Curriculum-Making for
Teachers of Primary Reading*

1. Past Practices in Curriculum-Making.
2. Activity Analysis as a Method of Curriculum-Making.
3. Consulting "Frontier Thinkers."
4. The Hypotheses on Which This Study Is Based.
5. Summary.

*Chapter II. The Objectives of Pri-
mary Reading*

1. Method of Arriving at Objec-
tives.

AN ANALYSIS OF THE DUTIES AND
DIFFICULTIES OF SUPERINTENDENTS
OF SMALL SCHOOL SYSTEMS ⁸

Chapter I. Introduction

1. The Problem.
2. The Thesis.
3. Procedure and Technique.
4. Brief Summary of Findings.

*Chapter II. The Problem to Be In-
vestigated and the Technique Used*

1. The Problem.
2. The Technique Used in the In-
vestigation.
3. Interpretations.
4. Tabulating All Returns.
5. General Summary of Conclu-
sions.

*Chapter III. The Duties of Superin-
tendents of Small School Systems*

1. Duties Performed by Superin-
tendents.

⁶ G. W. Frasier and F. L. Whitney, *Teachers College Finance*. Colorado Teachers College Education Series. Greeley, Colo.: Colorado Teachers College, 1930, No. 10; G. W. Frasier and F. L. Whitney, "Finance Publicity for the Teachers College," *The Teachers College Journal*, 1: 97-108, 1930

⁷ Pearl Merriman, *The Professional Preparation of Teachers of Reading in the Primary Grades of the Public Schools*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925.

⁸ Virgie L. Nanney, *Analysis of the Duties and Difficulties of Superintendents*

THE PROFESSIONAL PREPARATION OF
TEACHERS OF READING IN THE
PRIMARY GRADES (*Cont.*)

2. The Final List.

3. Summary.

*Chapter III. The Nature of the
Reading Process*

1. Characteristics of Reading.

2. Eye-Movement Studies.

3. The Fixation Pause.

4. Summary.

*Chapter IV. Reading Activities in the
Primary Grades*

1. Methods of Teaching Beginning
Reading.

2. Rate of Reading.

3. Remedial Work.

4. Summary.

*Chapter V. The Duties of Teachers
of Primary Reading*

1. Method of Analysis.

2. Results of Informational Analy-
sis.

3. Summary.

*Chapter VI. Teacher-Training Offer-
ings*

1. Method of Analysis.

2. Results of the Analysis.

3. Summary.

*Chapter VII. Colorado State Teach-
ers College Offerings*

*Chapter VIII. Summary, Conclu-
sions, and Recommendations*

1. General Summary.

2. Conclusions.

3. Recommendations.

4. Further Studies Needed.

Annotated Bibliography

Appendices

AN ANALYSIS OF THE DUTIES AND
DIFFICULTIES OF SUPERINTENDENTS
OF SMALL SCHOOL SYSTEMS (*Cont.*)

2. Additional Duties Suggested by
Superintendents Participating in
the Study.

3. Summary.

*Chapter IV. Methods of Learning
and the Use of Performance of
Duties of Superintendents*

1. Where Duties of Superintend-
ents Should be Learned.

2. Difficulty of Duties.

3. Comments and Criticisms.

4. Summary.

*Chapter V. General Summary and
Conclusions*

1. Essential Content of the Study.

2. Conclusions.

3. Recommendations.

4. Further Research Needed.

Appendix A

The Questionnaire and Other
Forms Used in the Investigation.

Appendix B

List of Small School Systems to
Which the Question List on Duties
and Difficulties of Superintendents
Was Sent.

It will be noticed that the report of the primary-reading study is in terms of very distinctive chapter heads, with the exception of the last, which presents the general summary and other matters. On the other hand, the second report has three routine chapter heads and two distinctive titles. Notice that each chapter that presents the distinctive material of the investigation is closed with a summary, that the first section of the last chapter in the first study summarizes in detail everything done and presented in the study from beginning to end, and that the last section of the first chapter in the second study reduces this large, inclusive summary to very brief form, perhaps only one paragraph. This section is very hard to write, and should, of course, be left until last of all. This and the general summary make the report much more useful to the busy educationist, who has to read it and get its contribution in as short a time as possible. To aid in this, it is sometimes required that an abstract (1,000 to 2,000 words) of the student research report be written and bound with the completed production.

Notice that neither report gives an entire chapter to related previous research. Such a review and evaluation is omitted entirely in the second study, and is perhaps included in the first chapter of the first. It is often desirable to give over an entire first chapter to this under some such title as, *Chapter I. Previous Investigations in the Field*. This practice helps to justify the study, to show its value and the necessity for it, and to give the trend of reflective thinking which the present undertaking continues. It also shows to what extent the beginner in research has actually oriented himself in the mass of available material bearing on the study he is reporting.

Notice that the second report gives in the first two chapters all methods that have been used. This material might well have been organized as a single chapter. The first report gives methods used in the first section of each chapter where new data are presented. Notice the use of appendices to contain tables, lists, or other material too bulky to be included among the discussions of the chapters. The appendices give very important matter, sometimes including the results of the primary classification of the returns of the study. The research worker should protect himself from any possible charge of unscientific carelessness or intellectual dishonesty by saving on file *all* of his *original material*. He should be ready to produce this material for checking and verification at any time. If it is too bulky to be included in his report as appendices, its location should be mentioned somewhere in the write-up. See Appendix I of a study of teaching success for one way to do this.⁹

⁹ F. L. Whitney, *The Prediction of Teaching Success*. Journal of Educational

Finally, the report should provide for future continuity in the field of research engaged in, as well as continue the trend of past investigation, as shown in the review of previous studies. This provision is made in the *Annotated Bibliography* and in the last section of the last chapter, "Further Research Needed."¹⁰

The annotated bibliography, in addition to showing the scholarly grasp the research worker has of the literature of his field of endeavor, is a very valuable gift to the next student who takes the torch of truth in an attempt to carry it farther along the road of reflective thinking toward the goal of a further contribution on a higher level of generalization. It should consist of those titles that have been most closely connected with any success attained in the study reported and that will therefore be most useful to the next researcher in starting his investigation.

A very careful list of topics and problems that have budded out of the project undertaken as it has progressed, but that could not be dealt with adequately, should be included in the section, "Further Research Needed." The worker should start at the very beginning of his research to keep notes for this section. It should be written up as a list of titles, with some brief justification for each and some hint as to procedures and methods. If the study reported is complicated and consists of a number of rather distinct parts, it is desirable to place at the conclusion of each logical segment of the report a section on further research needed. For an illustration of this arrangement, see the report on the arts college by F. J. Kelly, now of the United States Office of Education, to the Commonwealth Fund.¹¹

B. Levels of Discussion and Interpretation

At this point in the writing of the report, the beginner in research has before him on his desk an outline of chapter heads, each with its section titles subsumed. This layout must be considered, even now, as possibly tentative in any of its details. Writing should be a continuation of the act of reflective thinking. As one begins to write, new insights come that reveal relationships among parts of the data being presented that had not appeared before in the constructive imagination of the research worker. It often happens, as already suggested, that a single section title assumes importance enough to

Research Monograph Series. Bloomington, Ill.: Public School Publishing Company, 1924, No. 6.

¹⁰ John Dewey, *How We Think*. Boston: D. C. Heath and Company, 1933, p. 114.

¹¹ F. J. Kelly, *The American Arts College*. New York: The Macmillan Company, 1925.

become a chapter head. Or it may be that a proposed chapter must be used only as a section of another permanent chapter; or additional section topics must be added; or the order of chapters or of sections within chapters should be changed. If the reporter continues to *think* as he writes, he can often improve his table of contents and the logical organization of his report.

In addition to this plan of chapter and section titles, the reporter has at his right a pile of tables and at his left a pile of figures, resulting from the classification of his data on every level of generality reached. Of course, if qualitative philosophical data are being dealt with, graphic or tabular representation may not be feasible. But, if objective material has been used, two things should be done before actual writing begins. First, the piles should be put together, made into one, and numbered tentatively with pencil. Their order will be the estimated logical order of their presentation, as far as can be judged at this point. Second, this order will be tested, and confirmed or changed, by putting to the right of the proper section titles in the table of contents (the outline) the numbers of the tables and figures that will be included in the write-up in those places.

Now everything is ready for writing, and there are two criteria to have in mind. The material presented in tabular and graphic form should be both (1) *discussed* and (2) *interpreted*. In discussion, the research worker is trying to present the data a little more forcefully and with more attention to differences in value than appears in the table or figure itself. He refers to the group of findings by number (Table I or Figure 1), and perhaps by title; but he seldom repeats the exact phrasing of the title itself. And he calls attention to certain outstanding columns or items or single figures, or to the summarized data at the bottom of the table, or to the trend of surfaces of frequency (lines) on the graph. He talks about these details singly and in logical groups, in order to have the total impression they make on the reader clearer and more forceful. In fact, he furnishes a detailed analysis of the data presented. This is discussion.

But the research worker will never have a "thesis," will never come through with a creditable study adequately reported, unless he is able to go farther than this into an illuminating *interpretation*¹² of his data. This is the supreme test of the level of ability on which he is actually working, whether it be undergraduate or graduate. If he cannot properly interpret his material, he is not worthy of a higher degree.

¹² F. P. Frutchey, R. W. Tyler, and B. C. Hendricks, "Measuring the Ability to Interpret Experimental Data," *Journal of Chemical Education*, 13: 62-64, 1936.

It has been shown that writing the research report is the final agendum procedure (Chapter V). It should be considered also to be the culminating act of reflective thinking, the last step in the complete reasoning process. This is true, in particular, of that portion of the final report given to interpretation. The necessity for adequate interpretation in every realm of human thinking is emphasized by Glenn Frank, formerly president of the University of Wisconsin:

The future of America is in the hands of two men—the *investigator* and the *interpreter*. We shall never lack for the *administrator*, the third man needed to complete this trinity of social servants. And we have an ample supply of investigators, but there is a shortage of readable and responsible interpreters, men who can effectively play mediator between specialist and layman. The practical value of every social invention or material discovery depends upon its being adequately interpreted to the masses. Science owes its effective ministry as much to the interpretative mind as to the creative mind. The knowledge of mankind is advanced by the investigator, but the investigator is not always the best interpreter of his discoveries. Rarely, in fact, do the genius for exploration and the genius for exposition meet in the same mind. Many Negro mammies of the South can make a strawberry shortcake that would tempt the appetite of the gods, but they might cut sorry figures as domestic science lecturers. The interpreter stands between the layman, whose knowledge of all things is indefinite, and the investigator whose knowledge of one thing is authoritative. The investigator advances knowledge. The interpreter advances progress. History affords abundant evidence that civilization has advanced in direct ratio to the efficiency with which the thought of the thinkers has been translated into the language of the workers. Democracy of policies depends upon democracy of thought. "When the interval between intellectual classes and the practical classes is too 'great,'" says Buckle,¹³ "the former will possess no influence, the latter will reap no benefit." A dozen fields of thought are today congested with knowledge that the physical and social sciences have unearthed, and the whole tone and temper of American life can be lifted by putting this knowledge into general circulation. But where are the interpreters with the training and the willingness to think their way through this knowledge and translate it into the language of the street? I raise the recruiting trumpet for the interpreters.¹⁴

But what does interpretation mean? ¹⁵ It is rather difficult to answer this question in advising an individual research student. In fact, if the worker is really of graduate caliber, it will not be necessary. And, in any case, interpretation means something so intimately related to

¹³ Henry T. Buckle, *History of Civilization in England*. New York: D. Appleton-Century Company, 1876.

¹⁴ Glenn Frank, *Salesman of Knowledge*. Madison, Wis.: University of Wisconsin, 1935.

¹⁵ C. V. Good, A. S. Barr, and D. E. Scates, *The Methodology of Educational Research*. New York: D. Appleton-Century Company, 1938, pp. 617-627.

the content of each separate study that it is almost impossible to discuss it in general. However, some hint of what is meant may be gained by reading again the "Methods and Techniques" side of procedure VIII, and "Discuss and Interpret the Material," in the agenda reproduced in Chapter V. In general, interpretation means an adequate exposition of the true *meaning*¹⁶ of the material presented, in terms of the purposes of the study being reported, and of the chapter and section topics involved. It throws light on the real significance of the material in the context where it is found. It should include also the wider *implications* of the data that have been first discussed, giving hints of *conclusions* and *recommendations* to which they logically lead and that will be presented in detail in the last chapter of the report. In fact, the interpretative write-up of the report should constitute a conclusive exhibit of the fact that the entire list of activities connected with the investigation has been a process of reflective thinking. It will constitute the cream of this process, and will show forth the *values* of greatest worth that have resulted, including, of course, reference to important *generalizations* that have appeared and that will be presented in detail later. Of course, the final and most important level of interpretation will be in terms of objectives set up, and in particular of the ultimate objective. It should always be remembered that interpretation should include the meaning of the data and conclusions of the study in comparison with and in the light of all previous research. Although *comparison* is in itself perhaps contributory to the lowest level of interpretation, it may be the beginning of the discovery of illuminating meanings. These seven italicized key words give some indication of the interpretation in a good research report.

Many bases of interpretation are found in the research reports that one reads. Among neophytes, perhaps the most common tendency is to explain everything by taking as the criterion the central tendency of a situation. This is the fallacy of the median. The average of any distribution cannot be assumed to represent a satisfactory goal. Possibly the upper quartile point or even the best practice found is far below efficiency. The necessity for a wider view was well expressed by Francis Galton.

It is difficult to understand why statisticians commonly limit their inquiries to Averages, and do not revel in more comprehensive views. Their souls seem as dull to the charm of variety as that of the native of one of our flat English counties, whose retrospect of Switzerland was that, if its mountains could be

¹⁶ John Dewey, *How We Think*. Boston: D. C. Heath and Company, 1933, Chap. IX; B. H. Bode, *Conflicting Psychologies of Learning*. Boston: D. C. Heath and Company, 1929, Chap. XV; Hugh R. Walpole, *Semantics*. New York: W. W. Norton and Company, 1941.

thrown into its lakes, two nuisances would be got rid of at once. An Average is but a solitary fact, whereas if a single other fact be added to it, an entire Normal Scheme, which nearly corresponds to the observed one, starts potentially into existence.¹⁷

Attempts to interpret cause-and-effect relationships constitute another area of danger. Just concomitance, even high correlation, cannot be explained naïvely in this manner, without knowing all about the character and operation of all variables involved. Further, numerically large obtained coefficients cannot be ignorantly said to be either high or low. Their prediction value should be determined.

Many other inadequacies of interpretation might be cited. For example, in a social survey, frequency should not be the only criterion. Often cruciality points to items lower in the distribution, which should have weight in interpretation of values. Of course, social use and value are always significant bases for interpretation, but there is danger that widely held group attitudes and assumptions may color conclusions and recommendations unduly. All of these bases for interpretation, correct and inadequate, might be illustrated in existent research reports. A sane, broad-minded point of view on the part of the worker, as well as an adequate level of knowledge and skill, is necessary for their proper use or avoidance.

Correct attitudes and very careful and restrained interpretation of correlations, obtained in a study of business cycles in England by Dorothy S. Thomas of Yale University, are reported by H. R. Kemp of the University of Toronto in S. A. Rice's book of social analyses.¹⁸

Some of the coefficients were what would be considered distinctly low under any circumstances except strict normality of distribution. It therefore seemed desirable to have a further check-up on my interpretation. The probable error seemed to have little meaning with correlations of this sort, so I computed the standard deviations of the correlation coefficients. These also have no strictly interpretable meaning with data of this sort, but they are valuable in that they are direct functions of the size of the coefficient and the number of cases used in its computation. I used them as a rough check on my interpretations, but they could not be considered as giving my interpretations any real security; they merely made my inferences more reasonable.

But my interpretations will still have to be considered highly inferential. None of my results can be expressed simply and quantitatively. I cannot, for instance, quote odds in showing that these coefficients could not have

¹⁷ Francis Galton, *Natural Inheritance*. New York: The Macmillan Company, 1894, p. 62.

¹⁸ H. R. Kemp, "Mathematical Treatment by Dorothy Swaine Thomas of Social Data Arranged in Time Series," Analysis 41 in S. A. Rice, editor, *Methods in Social Science*. Chicago: University of Chicago Press, 1931, pp. 566-581.

resulted from chance alone. The most that I can say in any specific case, for instance suicide-rates, is that suicides are correlated inversely with the business cycle and that the coefficient is -0.50 . This series is, so far as I know, uncomplicated by any serious "interfering factors." It is statistically similar to the marriage-rates series, whose correlation with the business cycle (0.67) *I have assumed to be high*. The numerical value of this coefficient is high enough in comparison with this to lead to the inference that suicides are closely related to business conditions. This interpretation is strengthened by the fact that the coefficient is five times its standard deviation. The difficulties surrounding the use of correlation coefficients, as suggested by this study, are that they will rarely have a clear-cut meaning with sociological data. The advantages are that if interpreted within the context of the data they give a useful summary expression of relationship in an objective form.¹⁹

It is more difficult to find skill and adequacy in interpretation in masters' reports. Too often there is actually none. The entire content is given over to the presentation of new material obtained. This is in fine tabular or graphic form perhaps, but there is no attempt to extract meanings, nothing above the level of discussion. Often even the beginnings of interpretation, in parallel comparisons with the data of previous research, are omitted. This is inexcusable.

The report of L. E. King²⁰ of Pueblo, Colorado, to the Finance Committee of the Colorado Education Association may be cited as illustrating some attempt not only to report facts but also to explain their significance and conclude with worth-while recommendations for a more just distribution of state aid to rural elementary schools in Colorado. In addition to the generalizations given in the abstract, one finds in each chapter practical interpretations following presentation and discussion of material. This is all summated in the concluding chapter. Further, the section on "Previous Studies in the Field" analyzes comparative situations in other states, and the final statement of "Further Research Needed" suggests the place of the study in a complete research in the field.

The master's report of J. E. Chadwick of Colorado State College of Education is an illustration of a more adequate interpretation on the basis of facts of relationship than that in Dorothy S. Thomas's correlation study cited. Here factors involved in the achievement of college music majors in the Kwalwasser-Dykema music tests were used. Amount of training and ratings in applied music, class grades made in solfeggio, and native intelligence scores were the variables.

¹⁹ Dorothy S. Thomas, "Statistics in Social Research," *American Journal of Sociology*, 35: 1-17, 1929.

²⁰ L. E. King, *The Need of State Aid for Rural Elementary Schools in the State of Colorado*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1930.

The multiple and partial correlation technique was used to get inter-correlations; and regression equations for prediction of success in music, the criterion, were made. The realm of relationship was then graphed in terms of path coefficients for the dependent variable, teachers' ratings, and three independent factors—standard test scores, years of training, and native intelligence. This array made possible the calculation of coefficients of determination. These were transmuted to per cents; and were thus easily interpreted, as per cents are understood by everyone, while the meaning of coefficients of correlation is closed to many, as has been noted in Chapter XV.

His final interpretation is stated thus:

In the present study, the influence on teachers' ratings exerted by musical aptitude as measured by the Kwalwasser-Dykema music tests is slightly over four per cent, that of intelligence as measured by the American Council Psychological Examination is nearly seven per cent, and that exerted by training is slightly over three per cent. The interesting phase of the consideration of these direct influences is that intelligence on the part of the pupil seems to be such a large part, relatively, of teachers' ratings of ability. If the combined influences are proportioned on the basis of the ratio of the direct influences, the results are approximately ten per cent for intelligence, seven and a half per cent for aptitude, and five and a half per cent for training.²¹

The disabilities arising from the roughness of social science data are shown in this study by the fact that about seventy-seven per cent of the influence of independent variables was not measured at all. This was reported, also, as an indispensable item in adequate interpretation.

C. Style in Research Reporting

It has been said that the research student is obligated to make detailed reports of progress or to give well-rounded accounts of units of reflective thinking as he progresses toward the largest generalizations possible for him in the realm of inquiry where he is at work.²²

The particular type of English style that he uses should be determined by his audience. Who will read his report? His modest reaction to this question will be, "No one, probably"! But this is becoming increasingly untrue. Even typed masters' studies are in constant use within the institution and on loan from center to center. Many

²¹ J. E. Chadwick, *The Prediction of Success in Music*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1931.

²² Edward Weeks, *This Trade of Writing*. Boston: Little, Brown and Company, 1936; Arthur Minton, "Style in Education Periodicals," *English Journal*, 24: 724-727, 1935.

are listed in recurring bibliographies, and many are being abstracted and reviewed every year in separate bulletins, yearbooks, and in other publications. The beginning research worker should assume a wide audience of a rather technical sort, and he should write with this stimulus constantly in mind. This does not mean that he should attempt to write *up* to it by dragging in all the complications of technical terminology he can hear about. But, on the other hand, he should be permitted to assume a good knowledge of the necessary vocabulary of the scientific field in which both he and his readers are at work.

In fact, the researcher should remember that he is writing a scientific report, not a magazine article. If he is a doctor of philosophy, he is usually required to publish. On the master's level, one or more short technical journal articles²³ ought to result eventually from his work, but even then he should not permit himself consciously to write *down* to his audience. He will only be obligated to make his magazine report more popular in the sense that he gives fewer basic data, more generalizations, and omits as many purely technical terms as possible. Of course, there is the extremely nontechnical style for publication in the most popular magazines, but the beginner will no doubt use this very infrequently.²⁴

It must be admitted that the word *style* is perhaps too high-sounding a term to head this section, as the difficulties that have to be overcome are very often primarily those of the elementary mechanics of English and have but secondary reference to the problem of style itself. In fact, the situation is so universally bad that E. E. Elliott of Purdue University is led to exclaim in a recent review, "Apparently it is a doctoral dissertation, and therefore is marked by a slavish subjection to detail, by a characteristic drabness of style, and by an irritating absence of index."²⁵ He might add, in the same vein, "cumbering his text with that annihilation of all interest, the perpetual footnote." And a popular writer has recently said that "most historians and most scholars appear to write with something between a bath sponge and an axe."²⁶

May it not be said, without being unreasonable, that a research

²³ W. C. Eells, "Publication of Educational Research," *Journal of Educational Research*, 23: 31-42, 1931.

²⁴ P. H. DeKruif, "Before You Drink a Glass of Milk," *Ladies' Home Journal*, 46: 8 ff, 1929; J. H. Robinson, *The Humanizing of Knowledge*. New York: Doubleday, Doran and Company, Inc., 1924.

²⁵ E. E. Elliott, "Reviews," *Journal of Home Economics*, 6: 397, 1935; S. G. Tallentyre, *The Life of Voltaire*. Garden City: Garden City Publishing Company, 1938, p. 265.

²⁶ Bernard DeVoto, "The Skeptical Biographer," *Harper's Magazine*, 166: 180 ff, 1933.

adviser or a faculty in an institution of higher education ought to be able to assume that all matters connected with the elementary skills and bits of knowledge necessary to good writing have been taken care of on secondary and undergraduate collegiate levels? If they have not, they should be dealt with in the same manner as any other item of prerequisite for research in the graduate school. They should be conquered without additional academic credit. However, this does not mean that there is no obligation to furnish opportunity for more practice in English composition with the type of material that the research student is using. In connection with any classwork or seminar in research offered, there should be individual laboratory work with carefully organized practicums that will involve the discussion and interpretation of material very similar to that which the research worker will have to present later in his final report.

Undoubtedly there is a high positive correlation between good thinking and effective writing. The reasoning process of the research procedures should naturally lead to and merge into an adequate account of research activities. Ordinarily, such an account calls for straightforward exposition. But in places there will be description as well as some narration. The problem is to get clearly and in detail before the readers just what has been done throughout the investigation now completed, or it may be to reproduce for them with interpretations the items of a situation that has been dealt with. There is no place here for impassioned argumentation nor for the didactic method of persuasion; just an illuminating account of facts and larger generalizations discussed and interpreted is all that is necessary. And, as the unskilled reporter will find, this is enough to tax his English writing ability to its utmost, as he must have regard for basic principles of writing such as coherence and emphasis.

His problem is made more difficult because he is very often at work in the field of the social studies, where concepts are not as yet so definitely delimited and so certainly known as in the older, more objective disciplines. Word meanings are not universally accepted as yet here. This is a handicap that some writers attempt to overcome by including early in their report a list of carefully made definitions of the principal words to be used. One research writer gives an entire chapter of a 372-page book to such an attempt to make clear and definite the entities with which he is dealing.²⁷ Another presents such definitions in a glossary of terms at the close of the book.²⁸

²⁷ W. W. Charters, *The Teaching of Ideals*. Chicago: University of Chicago Press, 1925, Chap. II.

²⁸ F. L. Whitney, *Statistics for Beginners in Education*, "Glossary." New York: D. Appleton-Century Company, 1929, pp. 111-116.

Some indication of how thinkers write and learn to write has been given in Chapter II, in the case of such students as Herbert Spencer, T. B. Macaulay, Hervey Allen, and Harold Nicolson. Herbert Spencer's own characterization of his method may be found in his autobiography.²⁹ He gives intimate items, such as the fact that he was obliged to do again everything he had written over a period when he was trying vegetarianism. It lacked vigor. Goethe is said to have remarked:

The mind must not yield to the body. Thus I work more easily when the barometer is high than when it is low: since I know this I endeavor, when the barometer is low, to counteract the injurious effect by great exertion, and my attempt is successful.³⁰

Another example of the necessity for energy and concentration, perhaps drudgery, in good writing is found in the case of J. S. Mill, the English logician:

When I returned, my father was just finishing for the press his *Elements of Political Economy*, and he made me perform an exercise on the manuscript which Mr. Bentham practised on all his own writings, making what he called "marginal contents"; a short abstract of every paragraph, to enable the writer more easily to judge of and improve the order of the ideas, and the general character of the exposition.³¹

The problem of making historical reports readable, as well as accurate in content, is discussed in Chapter VIII. The literary form used by T. B. Macaulay has had a recent revival, beginning about ten years ago.³² His nephew's analysis of his method of writing should be a lesson of great value to any worker who is trying to make his report at the same time accurate and readable.

The main secret of Macaulay's success lay in this, that to extraordinary fluency and facility he united patient, minute, and persistent diligence. He well knew, as Chaucer knew before him, that

"There is na workeman
That can bothe worken wel and hastilie.
This must be done at leisure parfaitlie."

²⁹ Herbert Spencer, *An Autobiography*. New York: D. Appleton-Century Company, 1904, Vol. 1, pp. 462, 467, 542, 568, 598.

³⁰ J. P. Eckermann, *Words of Goethe: Being the Conversations of Johann Wolfgang von Goethe*. New York: E. P. Dutton and Company, 1931, p. 340.

³¹ J. S. Mill, *Autobiography of John Stuart Mill*. New York: Columbia University Press, 1924, pp. 80-82.

³² W. C. Abbott, "Macaulay and the New History," *Yale Review*, 18: 539-557, 1929.

If his method of composition ever comes into fashion, books probably will be better, and undoubtedly will be shorter. As soon as he had got into his head all the information relating to any particular episode in his "History" (such, for instance, as Argyll's expedition to Scotland, or the attainder of Sir John Fenwick, or the calling in of the clipped coinage), he would sit down and write off the whole story at a headlong pace; sketching in the outlines under the genial and audacious impulse of a first conception; and securing in black and white each idea, and epithet, and turn of phrase, as it flowed straight from his busy brain to his rapid fingers. His manuscript, at this stage, to the eyes of any one but himself, appeared to consist of column after column of dashes and flourishes, in which a straight line, with a half-formed letter at each end and another in the middle, did duty for a word. It was from amidst a chaos of such hieroglyphics that Lady Trevelyan, after her brother's death, deciphered that account of the last days of William which fitly closes the "History."

As soon as Macaulay had finished his rough draft, he began to fill it in at the rate of six sides of foolscap every morning; written in so large a hand, and with such a multitude of erasures, that the whole six pages were, on an average, compressed into two pages of print. This portion he called his "task," and he was never quite easy unless he completed it daily. More he seldom sought to accomplish; for he had learned by long experience that this was as much as he could do at his best; and, except when at his best, he never would work at all. "I had no heart to write," he says in his journal of March 6th, 1851. "I am too self-indulgent in this matter, it may be: and yet I attribute much of the success which I have had to my habit of writing only when I am in the humor, and of stopping as soon as the thoughts and words cease to flow fast. There are, therefore, few lees in my wine. It is all the cream of the bottle."

Macaulay never allowed a sentence to pass muster until it was as good as he could make it. He thought little of recasting a chapter in order to obtain a more lucid arrangement, and nothing whatever of reconstructing a paragraph for the sake of one happy stroke or apt illustration. Whatever the worth of his labor, at any rate it was a labor of love.

"Antonio Stradivari has an eye

That winces at false work, and loves the true."

Leonardo da Vinci would walk the whole length of Milan that he might alter a single tint in his picture of the Last Supper. Napoleon kept the returns of his army under his pillow at night, to refer to in case he was sleepless; and would set himself problems at the Opera while the overture was playing: "I have ten thousand men at Strasbourg; fifteen thousand at Magdeburg; twenty thousand at Würzburg. By what stages must they march so as to arrive at Ratisbon on three successive days?" What his violins were to Stradivarius, and his fresco to Leonardo, and his campaigns to Napoleon, that was his "History" to Macaulay. How fully it occupied his thoughts did not appear in his conversation; for he steadily and successfully resisted any inclination to that most subtle form of selfishness which often renders the

period of literary creation one long penance to all the members of an author's family. But none the less his book was always in his mind; and seldom, indeed, did he pass a day, or turn over a volume, without lighting upon a suggestion which could be turned to useful purpose. In May, 1851, he writes: "I went to the Exhibition, and lounged there during some hours. I never knew a sight which extorted from all ages, classes, and nations such unanimous and genuine admiration. I felt a glow of eloquence, or something like it, come on me from the mere effect of the place, and I thought of some touches which will greatly improve my *Steinkirk*." It is curious to trace whence was derived the fire which sparkles through every line of that terse and animated narrative, which has preserved from unmerited oblivion the story of a defeat more glorious to the British arms than not a few of our victories.

Macaulay deserved the compliment which Cecil paid to Sir Walter Raleigh as the supreme of commendations: "I know that he can labor terribly." One example will serve for many, in order to attest the pains which were ungrudgingly bestowed upon every section of the "History":

"March 21st.—To-morrow I must begin upon a difficult and painful subject, Glencoe.

"March 23d.—I looked at some books about Glencoe. Then to the Athenæum, and examined the Scotch Acts of Parliament on the same subject. Walked a good way, meditating. I see my line. Home, and wrote a little, but thought and prepared more.

"March 25th.—Wrote a little. Mr. Lovell Reeve, editor of the *Literary Gazette*, called, and offered to defend me about Penn. I gave him some memoranda. Then to Glencoe again, and worked all day with energy, pleasure, and, I think, success.

"March 26th.—Wrote much. I have seldom worked to better purpose than on these three days.

"March 27th.—After breakfast I wrote a little, and then walked through April weather to Westbourne Terrace, and saw my dear little nieces. Home, and wrote more. I am getting on fast with this most horrible story. It is even worse than I thought. The Master of Stair is a perfect Iago.

"March 28th.—I went to the Museum, and made some extracts about Glencoe."

On the 29th, 30th, and 31st of March, and the 1st and 2d of April, there is nothing relating to the "History" except the daily entry, "Wrote."

"April 3d.—Wrote. This Glencoe business is infernal.

"April 4th.—Wrote; walked round by London Bridge, and wrote again. To-day I finished the massacre. This episode will, I hope, be interesting.

"April 6th.—Wrote to good purpose.

"April 7th.—Wrote and corrected. The account of the massacre is now, I think, finished.

"April 8th.—I went to the Museum, and turned over the *Gazette de Paris*, and the Dutch dispatches of 1692. I learned much from the errors of the French Gazette, and from the profound silence of the Dutch ministers on the subject of Glencoe. Home, and wrote.

"April 9th.—A rainy and disagreeable day. I read a 'Life of Romney,' which I picked up uncut in Chancery Lane yesterday: a quarto. That there should be two showy quarto lives of a man who did not deserve a duodecimo! Wrote hard, rewriting Glencoe.

"April 10.—Finished 'Don Carlos.' I have been long about it; but twenty pages a day in bed while I am waiting for the newspaper will serve to keep up my German. A fine play, with all its faults. Schiller's good and evil genius struggled in it; as Shakespeare's in 'Romeo and Juliet.' 'Carlos' is half by the author of 'The Robbers' and half by the author of 'Wallenstein'; as 'Romeo and Juliet' is half by the author of 'Love's Labor Lost' and half by the author of 'Othello.' After 'Romeo and Juliet' Shakespeare never went back, nor Schiller after 'Carlos.' Wrote all the morning, and then to Westbourne Terrace. I chatted, played chess, and dined there.

"April 11th.—Wrote all the morning. Ellis came to dinner. I read him Glencoe. He did not seem to like it much, which vexed me, though I am not partial to it. It is a good thing to find sincerity."

That author must have had a strong head, and no very exaggerated self-esteem, who, while fresh from a literary success which had probably never been equalled, and certainly never surpassed—at a time when the book-sellers were waiting with almost feverish eagerness for any thing that he chose to give them—spent nineteen working days over thirty octavo pages, and ended by humbly acknowledging that the result was not to his mind.

When at length, after repeated revisions, Macaulay had satisfied himself that his writing was as good as he could make it, he would submit it to the severest of all tests, that of being read aloud to others. Though he never ventured on this experiment in the presence of any except his own family and his friend Mr. Ellis, it may well be believed that, even within that restricted circle, he had no difficulty in finding hearers. "I read," he says in December, 1849, "a portion of my 'History' to Hannah and Trevelyan with great effect. Hannah cried, and Trevelyan kept awake. I think what I have done as good as any part of the former volumes: and so thinks Ellis."

Whenever one of his books was passing through the press, Macaulay extended his indefatigable industry and his scrupulous precision to the minutest mechanical drudgery of the literary calling. There is no end to the trouble that he devoted to matters which most authors are only too glad to leave to the care and experience of their publisher. He could not rest until the lines were level to a hair's breadth, and the punctuation correct to a comma; until every paragraph concluded with a telling sentence, and every sentence flowed like running water. I remember the pleasure with which he showed us a communication from one of the readers in Mr. Spottiswoode's office, who respectfully informed him that there was one expression, and one only, throughout the two volumes of which he did not catch the meaning at a glance. And it must be remembered that Macaulay's punctilious attention to details was prompted by an honest wish to increase the enjoyment, and smooth the difficulties, of those who did him the honor to buy his books.⁸³

⁸³ G. O. Trevelyan, *The Life and Letters of Lord Macaulay*. New York: Harper & Brothers, 1904, Vol. II, pp. 198-203.

Detailed analyses of how writers write are not hard to find. The research neophyte can get many fine suggestions from them, which may aid him in making a better report of his investigation. See such personal accounts as that of W. S. Maugham³⁴ and the series in *The Saturday Review of Literature*, represented by the statement of J. T. Adams referred to in Chapter I.³⁵ Current weekly interviews with prominent writers on philosophy and method are to be found in the *New York Times Book Review*.³⁶

D. Standards of Form

The ancient saw, "What is worth doing at all is worth doing well," applies to the final typed, lithotyped, or printed form that the report of a research project should take. However, one finds great differences among institutions of higher education in this respect. It is not difficult to discover typed masters' studies from reputable universities which are not creditable at all in many matters of appearance, to say nothing of the more important consideration of value of content. And it is possible to find so-called doctors' dissertations in typed form buried in the libraries of certain well-known educational institutions. It is believed that the faculty of a graduate school owes it to students who are working with it to set up a definite organization such that needed advice on all matters connected with investigations undertaken may be forthcoming. This should include specific standards on the appearance of the final report and its value as a scientific contribution, when it is presented to the institution library.³⁷

If the beginner in research will examine a number of educational journals and books, he will recognize the fact that there is no usable agreement among them on matters of mechanical make-up such as footnotes, tables, figures, and the like. If he is preparing for publication, he must find out in detail just what is required by the editors of the magazine in which his article is to appear or of the series of books

³⁴ W. S. Maugham, *The Summing Up*. Garden City: Garden City Publishing Company, 1940. pp. 22-30.

³⁵ J. T. Adams, "My Methods as a Historian," *The Saturday Review of Literature*, 10: 777, 778, 1934.

³⁶ Robert Van Gelder, "An Interview with Mr. Hervey Allen," *New York Times Book Review*, 90: 2, July 6, 1941.

³⁷ J. E. Seyfried, *Principles and Mechanics of Research: With Emphasis on Term Reports and Theses*. Education Series. Albuquerque, N. Mex.: University of New Mexico, 1935, Vol. 9, No. 1; Faculty of the Graduate School, *English Style-Form Standards for Faculty and Students*. Greeley, Colo.: Colorado State College of Education, 1942; Allen Nevins, *Masters' Essays in History*. New York: Columbia University Press, 1933; R. M. Schmitz, *Preparing the Research Paper*. New York: Rinehart and Company, 1948.

to which he is adding. This may be done by an analysis of the journal or the book series in question. A number of publishers of educational books will furnish definite statements on all matters of style and form that the author needs to know.³⁸ Of course, if the institution has a publication department, definite standards are maintained, comparable to those in the situations above. Such is the case, for example, in Colorado State College of Education, with its Colorado Teachers College Education Series; in Teachers College, Columbia University, with its Contributions to Education, Teachers College Series; and in the University of Chicago with its Supplementary Educational Monographs and other series.

But it is discreditable in any research center not to establish equally as definite standards of form for the master's study that ultimately appears in a typed form bound in boards. It is true that there will be differences in the details needed among the different subject matter departments of the institution. For example, the reports of history studies may require a somewhat different treatment from those in biology or in mathematics. It may be that the standards used in the leading journal in the field of history, *The American Historical Review*, may be applied to the requirements of the master's report; and perhaps the same may be true in the other professionalized subject matter fields. What is suggested is that the central authority in any single institution should require each department to formulate and adopt definite standards of form for its own productions.

E. Evaluation of the Research Report

Important as are criteria for the form and the mechanics of the report of the research study, the beginner in research will recognize the fact that intrinsic values are, after all, to be sought above every other lesser consideration. It is not too severe a standard, even for a minor piece of research, such as is offered in partial fulfillment of the requirements for a master's degree, to have as the purpose the presentation of a "contribution to the sum of human knowledge," although this characterization is usually reserved for the doctor's dissertation. What is meant is that the master's thesis should be similar in kind to the doctor's report, in that it makes a worth-while contribution to the solution of important problems. Outside of the criteria of quality, there are limitations of time, funds, and energy that will, as a rule,

³⁸ W. C. Eells, "Publication of Educational Research," *Journal of Educational Research*, 23: 31-42, 1931. New York: The Macmillan Company, *The Authors' Book: Brief Notes for the Guidance of Authors in Dealing with Publishers*. New York: Prentice-Hall, Inc., *Author's Manual*.

restrict the study in extent and quantity to conform to the usual master's production.

But it should be just as scientific in method as the more extensive investigation. This is possible if the beginner in research profits by the right kind of advice from his faculty sponsor. It can be assumed at the beginning of a research project that a proper scientific method will eventuate in a worth-while scientific result, that the final report will be a creditable illustration of organized knowledge in the field of endeavor in which the research worker is busy, that it will be a listing of reflective thinking procedures.

The most generalized statement of a creditable standard for the content of a research report, then, is that it be scientific in method and in actual contribution made. It will be seen that to get these criteria one must go to accepted concepts of what science is and how it may be illustrated in any field of endeavor. The discussions of Chapter I on this subject will not be repeated here. It will be remembered that a large group of educational research workers, among whom an inquiry was made, did not report a conclusive consensus of judgment on a concept for the term *educational research*.³⁹ This is so because education is but making a beginning in the use of the scientific method, as are all the social studies. It should be expected that the word *research* will gradually take on new and more definite meaning as the field of educational studies is extended, the methods employed are refined, and techniques and tools of measurement perfected. However, this characterization is one of degree only with reference to research in the natural science field as well. All limitations on perfect reflective thinking apply there, also, but to a lesser degree.

Illustrative lists of criteria for checking the content of the research reports of students working toward higher degrees may be given. The first is intended to be used on the master's level. The second has in mind all graduate research activity in Colorado State College of Education.

CRITERIA FOR JUDGING THE MASTER'S THESIS ⁴⁰

1. Is the title descriptive, reasonably short, and correctly worded?

Introduction and Analysis of the Problem

1. Is the problem analyzed into definite subordinate questions or issues?
2. Is the logic of the analysis of the problem sound?

³⁹ F. L. Whitney, *et al.*, "Initiation Practices of Phi Delta Kappa," *Phi Delta Kappan*, 12: 122-126, 1929.

⁴⁰ H. H. Abelson, *The Art of Educational Research: Its Problems and Procedures*. Yonkers: World Book Company, 1933, pp. 308, 309.
Title

3. Does the introduction give a clear notion of the general scope of the research?
4. Are important terms that are employed in an unusual sense defined?
5. Is the discussion of previous research on the problem adequate?
6. Are the basic assumptions involved in the solution of the problem made clear?

Methods of Research

1. Is the method of solution logically sound?
2. Do the research methods chosen seem adequate for the solution of the problem?
3. Are the reasons for their choice made clear?
4. Are the research methods chosen adequately explained?
5. Is the research free from specific weaknesses in research methodology?

Collection and Treatment of the Data

1. Is the kind of data chosen adequate to the solution of the problem?
2. Are the data reasonably sufficient quantitatively for the solution of the problem?
3. Is there evidence of care and accuracy in the collection of the data?
4. Are any peculiar samplings of persons or materials involved adequately accounted for?
5. Is irrelevant material excluded?
6. Are the data presented an integral part of the logical solution of the problem rather than a mere encyclopedic enumeration?
7. Are the statements of important alleged facts validated by references to their proof?
8. Are the statistical or speculative methods of organizing and treating the data accurate?
9. Are they effective in leading toward the solution of the problem?

Summary and Conclusions

1. Are inferences from the data and findings sound?
2. Are all the conclusions based essentially on data made known to the reader?
3. Do the summary and conclusions include inferences relative to all significant data?
4. Are the conclusions free from mere opinion?
5. Are the limitations or qualifications of the conclusions clearly and concisely expressed?
6. Are applications and recommendations, where included, judiciously made?
7. Do the conclusions really serve to answer questions or issues raised in the introduction?

General Tone

1. Does the tone of the report display an unbiased, impersonal, scientific attitude?

2. Does the report show evidence of a sound background in the field?

Arrangement

1. Is the report subdivided into sections?
2. Are the sections appropriately headed?
3. Is the order of topics satisfactory?
4. Is the thesis free from unnecessary cross references?

QUALITATIVE STANDARDS FOR RESEARCH REPORTS ⁴¹

c. In accord with criteria set up by the graduate council, work on graduate research projects should be a process of reflective thinking involving: (a) the recognition of a difficulty in some specific field, (b) the definition of the difficulty in terms of a clearly stated problem, (c) the tentative adoption of an explanation or solution, the hypothesis, (d) the collection of pertinent evidence and evaluation of generalizations involved in the hypothesis investigated, (e) the final verification of an accepted hypothesis and the formation of a concluding generalization, (f) the appraisal of the new conclusion (generalization) in terms of its surety and predictive value.

d. Every research project should educate the investigator in scientific thinking. It should give him an understanding of the meaning of this process. It should develop an ability to use at least one type of procedure in scientific method. It should teach him the fundamental lesson of the difference between opinion and fact.

e. Every research project should be based on data that are original. If the research project represents a study of data secured by previous investigators, it must add something in improved techniques and adequate interpretation.

f. The problem chosen for investigation should be relatively significant; and it should be feasible. It should be delimited and stated clearly, in order that the principal objective of the research project may be certain.

g. Graduate research may seek to do any one or more of the following: (1) Discover new knowledge (generalizations) by using procedures and applying techniques known to be reliable; (2) discover the validity of proposed procedures and techniques of research; (3) verify the results of previous researches, by repeating procedures in new situations and with improved methods and techniques.

h. Every acceptable piece of research should utilize valid techniques. (1) The sampling should be adequate in kind and number; (2) the subjects should be appropriate to the purpose of the investigation; (3) valid procedures should be used for pairing, whenever pairing is used; (4) tools used for measuring should be valid for the purpose involved, as well as reliable; (5) correct statistical treatment should be applied when needed; (6) in appropriate types of research, the law of the single variable should be obeyed.

i. In the final report of the research project, the investigator should: (1) Organize logically the material presented; (2) show a detailed acquaintance with and give a complete analysis and evaluation of pertinent previous re-

⁴¹ Faculty of the Graduate School, *English Style-Form Standards for Faculty and Students*. Greeley, Colo.: Colorado State College of Education, 1949, pp. 26, 27.

search on the problem; (3) describe the source and nature of data in detail; (4) describe the method of investigation in detail; (5) define the experimental factor, if any, in detail; (6) point out weaknesses in the procedure used; (7) report negative data; (8) distinguish sharply between hypotheses and conclusions; (9) interpret the findings adequately; (10) point out need for further research and suggest unsolved problems.

Evaluative criteria for educational research are suggested by the executive council of Kappa Delta Pi in their administration of the first research award of the honor society. The first two conditions of the contest were:

1. No single method of investigation is specified. The research may be experimental, statistical, or philosophical in character. The pertinency of the method to the phase of the problem studied will be considered in judging the reports.
2. The basic criteria in judging the worth of a report will be its contribution toward the solution of the problem, the validity of the techniques employed, and the organization and literary merits of the report.⁴²

A list of criteria for the content of a piece of research has been obtained from an analysis of the literature of the subject and from the comparative criticism of sixty-one leaders in research in forty-two institutions of higher education and in state and national offices.⁴³ This is organized from the point of view of the graduate student and his advisers. The tentative values of the items have resulted from the collective judgment of large graduate student groups.

STANDARDS FOR THE CONTENT OF AN EDUCATIONAL RESEARCH PROJECT

1. Properly Delimits the Problem (Value 16).

(a) Defines the problem attacked adequately and (b) places it definitely in the particular field of research in which the student is working.

2. Uses Appropriate Methods (Value 17).

Employs (a) the historical, (b) experimental, or (c) predictive types of investigation carried perhaps onto the level of (d) philosophical analysis, each applied specifically to the field of endeavor engaged in.

3. Exhibits Originality (Value 19).

(a) The problem attacked is either new or distinctive; (b) the techniques used are adequate to the conditions of the study; (c) the method of report-

⁴² A. L. Hall-Quest, "Foreword," in W. H. Lancelot, A. S. Barr, T. L. Torgenson, C. E. Johnson, V. E. Lyon, A. C. Walvoord, and G. L. Betts, *The Measurement of Teaching Efficiency*. New York: The Macmillan Company, 1935, p. vi.

⁴³ F. L. Whitney, "The Evaluation of Educational Research," *School and Society*, 31: 289-290, 1930.

ing illustrates a high type of ability in discussion and interpretation of material presented.

4. Uses Proper Thinking Methods (Value 26).

(a) Determines actual ultimate aim, (b) states title correctly, (c) carefully states the problem, (d) discovers the thesis, (e) insures continuity with previous research by checking the findings of all other workers in the field entered, (f) arranges procedures with the ultimate objective in view, (g) selects the best methods for each item of procedure, (h) sets up the form of report logically and psychologically as chapter heads and section titles, (i) maintains an open-minded and critical attitude at every stage of progress through the research, (j) provides for continuity of research onto the next level of reflective thought by the next research worker.

5. Presents a Worth-While Contribution to Education (Value 22).

The study results (a) in generalizations on a higher level of scientific thought, which take the form of (1) hypotheses, (2) theories, (3) principles, (4) laws, (5) standards, (6) historical trends, or (7) prognoses; (b) in new data presented or old information and materials organized into new forms and relationships with adequate interpretations; (c) in better methods in educational research, or the development of new techniques or the validation of old techniques, or their use in new fields; (d) in new tools of precision for use in handling educational concepts; (e) in the application of findings to concrete educational problems.

The Purdue University rating scale takes into account the research student's ability and preparation as well as the value of his report.

PURDUE RATING SCALE

The scaled items listed below are set up as criteria of the factors usually considered in the final oral examination of candidates for the graduate degrees. The first four items bear directly on different aspects of the individual candidate's special research, and indirectly on his knowledge, abilities, and insight. Items 5 to 8 inclusive bear directly on the candidate's knowledge, abilities, and insight, and indirectly on different aspects of his special research. Items 7 and 8 bear directly on the candidate's general preparation. Item 9 requires a general estimate of the candidate.

1. The Relative Importance of the Thesis-subject

Fundamental—basic in the particular field.	Substantial—of considerable importance in the particular field.	Trivial—of little or no consequence in the particular field.
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2. The Intelligibility of the Thesis

Lucid—clearly expressed, the meaning unmistakable.	Understandable—the meaning somewhat involved to begin with but later cleared up.	Incomprehensible—impossible of being understood.
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3. The Method Used in the Special Research

Experimental—systematic analysis of the data already available, further experimentation, and generalization according to the facts established.

Investigational — critical evaluation of the data available, and generalization according to logical principles.

Inspectional—survey of sources, summarization of what is known, thought, and “felt” about the subject.

4. The Accuracy of the Conclusions

Exact—agrees precisely with the facts.

Approximate—not exactly accurate but sufficiently so for practical purposes.

Erroneous—not in agreement with the facts.

5. The Candidate's Insight into the Implications of His Thesis

Conceptive—ability to discern readily the relationships involved and to point out the theoretical and practical possibilities without assistance.

Discriminative—ability to identify possibilities when the relationships involved are made more or less obvious.

Perceptive—ability to recognize possibilities only when they are pointed out.

6. The Candidate's Ability to Defend His Method, Procedure, and Conclusions

Impressive—ability to advance, on the instant, extremely pertinent and well-formulated supporting arguments, in a very telling manner.

Ordinary—ability to advance, after some time for reflection and in a none too convincing manner, supporting arguments that are as a rule not any too well thought out and not altogether pertinent.

Inappreciable—inability to advance any supporting arguments whatsoever.

7. The Candidate's Background of Knowledge

Profound — consisting of a complete system of all of the known facts and theories involved.

Substantial — consisting of a considerable body of facts, theories, and general impressions.

Superficial — consisting of general impressions.

8. The Quality of the Candidate's General Vocabulary

Rich—consisting of an extremely large number of exactly defined words replete with meaning.

Limited—consisting of a relatively large number of fairly well-defined words having limited meaning.

Meager—consisting of a very few ill-defined words having very limited meaning.

9. General Estimate of the Candidate

Unusually well prepared—knows almost all, if not everything there is to be known in his field, is well informed in general, and is able to discern readily the most significant in the way of means and ends.

Fairly well prepared—fairly well informed in his field and in general, and is able to recognize significant means and ends when the relationships involved are not too complicated.

Poorly prepared—knows very little in his field and less in general, and is very slow of understanding even the most obvious of means and ends.

Finally, in 1937, the Committee on Awards of the American Educational Research Association, working with a large group of cooperating judges, set up the following four-point scale of values to be used annually in rating about fifty research reports nominated by members of the association and the faculties of "major" graduate departments of education in colleges and universities.

Rating A. A research of distinction, i. e., one that (1) reflects a high quality of scholarship and (2) makes an important contribution to the science of education. In judging the quality of scholarship, give attention to the author's interpretation of his findings as well as to the ingenuity and resourcefulness which he exhibits in collecting and handling his data. The contribution may be either findings of practical significance or the development of techniques which promise to be useful in future research.

Rating B. A research of high but not distinctive merit. The principal difference between A and B ratings is in the degree of ingenuity and resourcefulness of the investigator and the quality of his interpretations.

Rating C. A research of merit but one that is subject to significant limitations such as insufficient data for generalization or inadequacy of treatment or interpretation.

Rating D. A work not worthy of selection. Include under this rating textbooks and other writings considered not to be research, as well as researches of definitely inferior quality.

The six awards for a typical year were as follows:

H. M. Bell, *Youth Tell Their Story; A Study of Conditions and Attitudes of Young People in Maryland between the Ages of 16 and 24*, Conducted for American Youth Commission. Washington, D. C.: American Council on Education, 1938; H. M. Bond, *Negro Education in Alabama: A Study in Cotton and Steel*. Washington, D. C.: Associated Publishers, Inc., 1939; G. T. Buswell, *How Adults Read*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1937, No. 45; L. L. Chism, *The Economic Ability of the States to Finance Public Schools*, Contributions to Education. New York: Teachers College, Columbia University, 1936, No. 669; F. H. Swift, *European Policies of Financing Educational Institutions*. Berkeley, Calif.: University of California Publications in Education, Vol. 8. I. *France*, 1933, pp. 1-180; II. *Czechoslovakia*, 1934, pp. 181-250; III. *Austria*, 1934, pp. 251-344; IV. *Germany*, 1930, pp. 345-694; V. *England and Wales*, 1939, pp. 694-971; L. L. Thurstone, *Primary Mental Abilities*. Psychometric Monographs. Chicago: University of Chicago Press, 1938, No. 1.

The research student and his adviser should study these statements of what constitutes creditable reporting of research. They should also consider the more analytical lists of criteria given in the eight score cards of Chapters VII to XIV. Evaluation and selection of standards for actual use should be on the basis of the thesis developed in Chapter I. Good research, whether in the social realm or in natural science, is in terms of the six steps of the Dewey-Kelley process of reflective thinking.

F. Summary

The beginner in research will have greatest success in the final form the report of his investigation takes if he arranges the material that constitutes the content of his contribution logically and in accord with meaningful relationships among its many items. One of the best forms for this is the tabular outline with section subheads.

A successful presentation of the findings of the research should be on two levels, discussion and interpretation. Discussion will present the data resulting from the study more analytically and with more regard to differences of value than appears in tables and figures found in the context. Interpretation will aim to disclose real meanings discovered in the material presented, as related to such integrating influences as the ultimate aim, the problem, and the more general chapter and section topics.

The English style used in writing the report of a research is as a rule either straightforward exposition or description and narration. Any persuasive or educative purpose that the report may be intended to

serve cannot be accomplished through the use of argumentation or hortatory language. Further, the reporter should always have his actual audience in mind, but he should never attempt to write either *up* or *down* to it. His production should be a scientific report.

Standards of form and of content for the research report are of much importance. The former should be decided on in detail in accord with whatever agreement is found on the larger matters among research centers and publishing houses, but in the institution itself there is an obligation on the part of those in control to come to definite decisions on every point and to enforce the detailed list of requirements. In the more important matter of intrinsic value of the content of a study, there should be general acceptance among workers in research centers on such matters as pertinency of techniques used, originality of the study, value of outcomes, reflective-thinking methods followed, and the degree to which a real contribution has been made. In fact, the report should be scientific in method and on a high level of value as to result.

G. Research Exercises

1. (a) Examine and criticize the tables of contents of six masters' studies and six doctors' dissertations in the light of the discussion of the outline given in Section A in this chapter. (b) Find and analyze a survey research report that gives over the first chapter to a general summary. (c) Analyze the chapter summaries and the general summary in two masters' studies, and report on whether they really *summarize* the material presented before in extended form.

2. (a) Analyze a number of masters' studies and report on the best presentation of the literature of the field you can find, telling just how it is done. (b) Analyze two masters' studies and report on and criticize the manner in which the origin of the study is given and the methods used are described.

3. (a) Analyze two masters' studies and report on the manner in which the appendices are used. (b) Analyze two masters' studies and criticize the general bibliographies included. (c) Analyze two masters' studies and report on the possibility of a complete recheck of the details of methods and techniques used, on the basis of what is given in the report.

4. In a certain college, a student was refused his master's degree because of "peculiarity of method and style in his report, which brought into question his scholastic integrity." Discuss this case.

5. Cite a possible case of intellectual dishonesty in reporting a true research. If you know of an actual case, give the details of it without revealing names involved.

6. (a) Analyze the lists of tables and of figures in a master's study, and report on whether they are given in logical order. (b) Analyze the same

tables and figures and classify them in terms of levels of generalization they represent. Which are on the lowest level, resulting from the primary classification of data, which on a second level, and so on?

7. (a) Analyze a master's study and the success in *discussion* found, as to whether it is adequate, clear, verbose, unnecessary, too long, and so on. (b) Analyze a master's study and criticize the form of references to tables and figures made in the paragraphs.

8. (a) Take a table given you by your instructor and write a detailed *discussion* of it. (b) Analyze six masters' studies and report a judgment on the adequacy of *interpretation* found. (c) Locate the activities, *discussion* and *interpretation*, in the proper steps of the thinking process set forth in Chapter I, Section A.

9. (a) Take a figure given you by your instructor and write a detailed *discussion* and an adequate *interpretation* of data found in it. (b) Write a paragraph describing what *discussion* means in the particular study that you are reporting. (c) Write a paragraph describing what *interpretation* means in the particular study that you are reporting.

10. (a) Make a difficulty analysis of the English of three masters' studies, reporting by frequencies all errors found and classifying details tabulated finally as errors either in mechanics or in style.⁴⁴ (b) Make an inquiry among half a dozen graduate schools and report their practices in English prerequisites for graduate work and in provision for practice in writing in the graduate school or elsewhere by graduate students, with or without credit.

11. Organize and write out a practicum that involves practice in writing such material as is gathered in research.⁴⁵

12. Report on the actual audience of the masters in the educational institution you are attending by compiling from the library records (a) withdrawals of masters' studies, (b) their use in the library reading rooms, and (c) their loan to other research centers—all over the period of the previous academic year.

13. (a) Find in the current journals for one recent month all of the reviews or abstracts of masters' studies you can. (b) Find, in recently published magazine articles and books, references to twelve masters' studies.

14. (a) Analyze the issues of an educational journal for one year and report on standards of form that maintain for articles accepted. (b) Analyze the issues of a subject matter journal for one year and report on standards of form that are maintained for articles accepted. Use for this exercise the leading magazine in the subject field of your own specialty.

15. (a) Report on what proportion of the tables and figures of a selected master's study conform to the standard of being "a logical unit of thought,"

⁴⁴ R. C. Pooley, *A Classification Test in English Composition Abilities*. Unpublished Master of Arts Thesis, Colorado State Teachers College, 1927.

⁴⁵ S. F. Trelease, *The Scientific Paper*. Baltimore: Williams and Wilkins, 1947.

"a complete and independent unit of information," which "can be understood, is isolated from the context in which it is found."⁴⁶ (b) Report on what proportion of the tables and figures of a selected master's report conform to the standards of "brevity and simplicity."

16. (a) Put the following mental test scores of state teachers-college graduates in correct tabular form in accordance with accepted criteria for classification: 180, 230, 200, 170, 100, 95, 98, 160, 170, 150, 157, 101, 130, 150, 157, 200, 220, 210, 205, 175, 140, 145, 100, 96, 105, 109, 112, 113, 115, 123, 127, 129, 122, 133, 134, 137, 141, 145, 144, 153, 152, 163, 107, 168, 171, 184, 186, 190, 197, 199, 201, 216, 230, 235, 237, 239. (b) Draw a figure, using the data of this table, or a part of them. (c) Discuss and interpret the table and the figure (Chapter XV).

17. Analyze and evaluate two masters' reports in terms of one of the lists of criteria given in Section E.

18. Let the group criticize the numerical values for each of the main divisions of the score cards given in Section E. Then let each student analyze and evaluate the *content* of two masters' reports.

19. (a) Interview and get the conception of ten academic doctors in education on the actual meaning of the phrase, "a contribution to the sum of human knowledge," as used in connection with their dissertations. (b) How may a master's study equal in quality a more extensive doctor's investigation? (c) Report on instances of masters' studies that have become later doctors' investigations.⁴⁷

20. Present the list of standards for content, given in Section E, to ten faculty members who have master's or doctor's degrees, asking them to criticize it in detail on the following points: (a) What other general headings, in addition to the five given, should be included? (b) Is the characterization under each heading inclusive and correct? (c) On a scale of 100 points, what values would you give each of the five general headings (or of the six or more, if you add any)?

21. Analyze several reputable research reports by outstanding scientists to determine their use of footnotes. See "cumbering his text with that annihilation of all interest, the perpetual footnote." S. G. Tallentyre, *The Life of Voltaire*. Garden City: Garden City Publishing Company, 1938, p. 265; R. E. Sherwood, *Roosevelt and Hopkins, An Intimate History*. New York: Harper & Brothers, 1948. See Introduction, p. XVII, "As to the problem of footnotes—as an inveterate reader of history and biography, I have long been plagued and angered and aged prematurely by contemplation of pages

⁴⁶ Faculty of the Graduate School, *English Style-Form Standards for Faculty and Students*. Greeley, Colo.: Colorado State College of Education, 1949, pp. 26, 27.

⁴⁷ T. J. Mahan, *A Study of the Duties, Difficulties, and Traits of Citizenship*. Greeley, Colo.: Unpublished Master of Arts Thesis, Colorado State Teachers College, 1925; and *An Analysis of the Characteristics of Citizenship, Contributions to Education*. New York: Teachers College, Columbia University, 1928, No. 315.

of type which were pock-marked with asterisks, daggers, and other nasty little symbols which pulled my eye down to small type at the bottom of the page and sometimes forced me to read on through the bottoms of subsequent pages before I could get back to the middle of the sentence from which I had been diverted and resume the narrative."

APPENDIX I

Samples of Reports of Doctors' and Masters' Studies from Institutions of Higher Education

Search should be made for the latest and current titles. Check the reports that are issued annually.

University of Arizona, Tucson, Arizona

Abstracts of Theses for Higher Degrees, 1939 and 1940, Graduate College, *University of Arizona Record*, Vol. 34, 1941.

"Advanced Degrees, 1939-1940," *University of Arizona Record*, Vol. 34, pp. 275-280, June, 1941.

Boston College, Chestnut Hill, Massachusetts

Subjects of Theses Submitted in Partial Fulfillment of Requirements for Degrees. Graduate School, Boston College, Chestnut Hill, Massachusetts (June, 1932).

Bucknell University, Lewisburg, Pennsylvania

Bucknell Journal of Education. Bucknell University, Lewisburg, Pennsylvania (January, 1932).

University of California, Berkeley, California

A. E. Joyal, *Abstracts of Doctors' Theses in Education at the University of California, 1898 to March, 1933*. Lambda of Phi Delta Kappa, University of California, 1933.

California Universities

F. C. Touton, "Theses Written in California Universities in Candidacy for Graduate Degrees in Education During the Academic Year, 1933-1934," *California Quarterly of Secondary Education*, Vol. 9, pp. 77-94, 1933.

See footnote 50, Chapter III.

Catholic University of America, Washington, D. C.

Doctoral Dissertations, 1929-1932. Catholic University of America, 1932.

University of Chicago, Chicago, Illinois

E. E. Brachter, "Doctor of Philosophy Degrees in Education Conferred During 1928-30," *Zeta News*, Vol. 16, No. 1, pp. 11-13. Zeta of Phi Delta Kappa, School of Education, University of Chicago, 1930.

C. H. Judd, *Annotated List of Graduate Theses and Dissertations, 1900-1931.* School of Education, University of Chicago, 1932.

Abstracts of Theses, Humanistic Series, Vol. IV, 1925-1926. University of Chicago, 1928.

Doctors of Philosophy. Announcements: The University of Chicago, Vol. 31, No. 19. University of Chicago, 1931.

"Masters' Degrees in Education," *Zeta News*, Vol. 16, No. 2. Zeta of Phi Delta Kappa, University of Chicago, 1931.

Titles of Graduate Theses and Dissertations, Department of Education, The University of Chicago, 1932/35. Department of Education, University of Chicago, 1936.

Jim Webb, "Members of Zeta Chapter Who Received the Master of Arts Degree in 1929 to 1930," *Zeta News*, Vol. 16, No. 1, pp. 14-16, University of Chicago, 1930.

Supplementary Educational Monographs, Department of Education, University of Chicago (current).

Zeta Chapter of Phi Delta Kappa, University of Chicago, "Degrees in Education, June Convocation, 1931," *Zeta News*, Vol. 16, No. 4, pp. 20, 21, 1931.

University of Cincinnati, Cincinnati, Ohio

C. V. Good, *et al.*, *Abstracts of Graduate Theses in Education, Teachers College, University of Cincinnati, 1927-1931.* Teachers College, University of Cincinnati, 1931.

Abstracts, Graduate Theses in Education, 1937-1939. Teachers College, University of Cincinnati, 1940.

Clark University, Worcester, Massachusetts

Abstracts of Dissertations and Theses, 1934, Bulletin, Vol. 5. Clark University, 1933.

Abstracts of Dissertations and Theses, 1940, Vol. 12, Clark University Bulletin No. 150, 1940.

University of Colorado, Boulder, Colorado

"Abstracts of Theses for Higher Degrees," *University of Colorado Studies.* University of Colorado, to date.

Colorado State College of Education, Greeley, Colorado

Abstracts of Field Studies for the Degree of Doctor of Education, Vols. I. II. University Microfilms, Ann Arbor, Michigan, 1940 to date.

Columbia University, New York

Margaret Roys, *Masters' Essays*, 1934. University Library Bulletin, Columbia University, 1932.

Bulletin: Register of Teachers College Doctors of Philosophy, July 1, 1933 to June 30, 1934. Twenty-fourth Series, No. 8. Teachers College, Columbia University, 1933.

Columbia University Library, *Masters' Essays*, 1939. Columbia University Press, 1939.

Barstad, Anvor, et al., editors, *Bulletin: Register of Doctoral Dissertations Accepted in Partial Fulfillment of the Requirements for the Degree, Ph. D., Vol. 1, 1899-1936*. Teachers College, Columbia University, 1937.

"Register of Doctoral Dissertations Accepted in Partial Fulfillment of the Requirements for the Degree, Ph. D.; Fourth Annual Supplement, 1940," *Teachers College Record*, Vol. 42, pp. 546-558, 1941, et seq.

Cornell University, Ithaca, New York

G. H. Sabine, editor, *Abstracts of Theses Accepted in Partial Satisfaction of the Requirements for the Doctor's Degree, 1940, to Which is Appended a List of Titles of Theses Accepted in 1940 for the Master's Degree*. Cornell University Press, 1941.

University of Denver, Denver, Colorado

"Abstracts of Theses in Education, July 1, 1930, to June 30, 1938, with Supplemental List Prior to July 1, 1930," *Educational Research Bulletin*, No. 1, Alpha Sigma Chapter, Phi Delta Kappa, 1930.

Eastern Illinois State Teachers College, Charleston, Illinois

F. A. Beu, *The Junior High School, An Annotated Bibliography*, Bulletin No. 113. Eastern Illinois State Teachers College, 1931.

East Texas State Teachers College, Commerce, Texas

Graduate Studies, 1939, East Texas State Teachers College, *Bulletin*, Vol. 22, No. 4, 1940.

H. M. Lafferty, *Graduate Studies*, 1940, Bulletin No. 7. East Texas State Teachers College.

University of Florida, Gainesville, Florida

"Graduate Theses and Dissertations, 1906-1938," *Library Bulletin*, Vol. 8, Nos. 5 and 6, 1939.

Fordham University, New York

Dissertations Accepted for Higher Degrees in the Graduate School of Arts and Sciences, 1939. Fordham University Press, 1939.

George Peabody College for Teachers, Nashville, Tennessee

Class in Education 581, George Peabody College for Teachers, Nashville, Tennessee, editors, "Masters' Theses Produced in State Teachers Colleges," *Teacher-Training News*, pp. 4-61, 1934.

Psi Chapter of Phi Delta Kappa, George Peabody College for Teachers, "Abstracts of Dissertations and Theses Written by Members of Psi Chapter," *News-Letter*, Vol. 6, pp. 7-34, 1931.

Harvard University, Cambridge, Massachusetts

Iota Chapter of Phi Delta Kappa, Harvard University, Cambridge, Massachusetts, *Doctorate Theses in Harvard Graduate School of Education*, Bulletin No. 10, pp. 11-14, 1931.

Graduate School of Arts and Sciences, Harvard University, *Summaries of Theses Accepted in Partial Fulfilment of the Requirements for the Degree Ph. D., 1938.* Harvard University Press, 1940.

University of Illinois, Urbana, Illinois

R. T. Gregg and T. T. Hamilton, Jr., *Annotated Bibliography of Graduate Theses in Education at the University of Illinois*, Bulletin No. 55. University of Illinois, 1931.

Indiana State Teachers College, Terre Haute, Indiana

J. W. Jones, editor, "Abstracts of Unpublished Masters' Theses, Indiana State Teachers College, 1933 and 1934," *Teachers College Journal*, Vol. 5, pp. 217-264, 1934.

"Abstracts of Unpublished Masters' Theses, Indiana State Teachers College," *Teachers College Journal*, Vol. 20, pp. 20-22, 1948.

Indiana University, Bloomington, Indiana

Alpha Chapter of Phi Delta Kappa, Indiana University, Bloomington, Indiana, "Brief Summaries of Theses Presented to the School of Education at Indiana University," *News-Letter*, pp. 1-60, 1931.

State University of Iowa, Iowa City, Iowa

Louis Pelzer, editor, *Abstracts in History II*. State University of Iowa Studies, Vol. 10, No. 3. State University of Iowa, 1934.

"Doctoral Theses in Education IV," State University of Iowa, Studies N. S. No. 368; *Studies in Education*, Vol. 10, No. 5. State University of Iowa, 1939.

"Programs Announcing Candidates for Higher Degrees, 1940," State

University of Iowa, *Studies; Series on Aims and Progress of Research*, No. 66. State University of Iowa, 1940.

Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa

Candidates for Advanced Degrees in the Graduate College, 1934-35. Bulletin, Vol. 33, No. 50. Iowa State College of Agriculture and Mechanic Arts, 1935.

Roster, Doctors of Philosophy, 1916-1934. Iowa State College of Agriculture and Mechanic Arts, 1934.

Johns Hopkins University, Baltimore, Maryland

Circular: Doctors' Dissertations, 1876-1926. New Series, 1926, No. 8. Johns Hopkins Press, 1926.

University of Kansas, Lawrence, Kansas

Thesis Titles, 1920-1932. University of Kansas, 1932.

"Abstracts of Doctoral Dissertations in Education, Completed in 1940." University of Kansas, Lawrence, Kansas, 1941, *Kansas Studies in Education*, Vol. 2, No. 6, 1941.

Kansas State Teachers College, Emporia, Kansas

E. J. Brown, *et al.*, "Annotated Bibliography of Dissertations Accepted for the Master of Science Degree, Kansas State Teachers College of Emporia, 1929-1939," Kansas State Teachers College, Emporia, *Bulletin of Information; Studies in Education*, No. 17, 1939.

E. J. Brown, *et al.*, "An Annotated Bibliography of Dissertations Accepted for the Master of Science Degree, Kansas State Teachers College of Emporia, 1939," Kansas State Teachers College, Emporia, *Bulletin of Information*, Vol. 19, No. 9, 1939.

Kansas State Teachers College, Pittsburg, Kansas

O. P. Dellinger, *et al.*, "Advanced Degrees Conferred, May 31, 1934 and August 2, 1934," *Graduate Bulletin*, Vol. 31, pp. 29-31. Graduate Division, Kansas State Teachers College, 1935.

University of Kentucky, Lexington, Kentucky

Louis Clifton, *et al.*, "Research in Alpha Nu Chapter," *News Letter of Alpha Nu Chapter*, pp. 15-26. Alpha Nu of Phi Delta Kappa, University of Kentucky, March, 1932.

Bulletin: Theses in Education, Vol. 5, No. 4. Bureau of School Service, College of Education, University of Kentucky, 1933.

Stanford University, California

Abstracts of Dissertations for the Degree of Doctor of Philosophy with

the *Titles of Theses Accepted for the Degrees of Master of Arts and Master of Engineering, 1930-1931*. Stanford University, 1931.

C. L. Alsberg, *Abstracts of Dissertations, Stanford University, 1928-1929*, Vol. 4, Bulletin. Stanford University, 1929.

"Abstracts of Dissertations for the Degrees of Doctor of Philosophy and Doctor of Education, with the Titles of Theses Accepted for the Degrees of Master of Laws, Engineer, Master of Education, and Master of Arts, 1938-39," *Stanford University Bulletin*, Vol. 14, 6th Ser., No. 90, 1939.

Library of Congress, Washington, D. C.

May M. McNair, *A List of American Doctoral Dissertations Printed in 1921*. Library of Congress, 1923.

Louisiana State University, Baton Rouge, Louisiana

"Abstracts of Theses, 1939 and 1940, Louisiana State University and Agricultural and Mechanical College," *University Bulletin*, Vol. 33, N. S. No. 1. Louisiana State University Press, 1941.

Melbourne University, Melbourne, Australia

J. D. G. Medley, *et al.*, "Australian Educational Studies," Melbourne University, *Educational Research Series*, Second Series No. 59. Melbourne University Press, 1940.

University of Michigan, Ann Arbor, Michigan

Clifford Woody, *Abstracts of Dissertations and Theses in Education, 1931-1932*. Monograph No. 2, Bureau of Educational Reference and Research. School of Education, University of Michigan, 1933.

"Recent Masters' Theses . . . 1940," *University of Michigan School of Education Bulletin*, Vol. 12, No. 4, pp. 62-71, 1941.

University of Minnesota, Minneapolis, Minnesota

Fred Engelhardt and H. J. Otto, *Masters' and Doctors' Theses in Education, 1912-1928*. University of Minnesota, 1928.

S. D. Fink and J. G. Umstadt, *Abstracts of Masters' and Doctors' Theses in Education, University of Minnesota, July 1, 1930 to July 1, 1931*, Educational Research Bulletin No. 4. Eta of Phi Delta Kappa, College of Education, University of Minnesota, 1932.

G. S. Ford, *A Register of the Ph. D. Degrees Conferred by the University of Minnesota, 1888-1932*. The University of Minnesota Press, 1932.

J. E. Grinnell and J. G. Umstadt, *Abstracts of Masters' and Doctors' Theses in Education, University of Minnesota, 1929 to 1930*, Educational Research Bulletin No. 2. Eta of Phi Delta Kappa, College of Education, University of Minnesota, 1931.

M. E. Haggerty, *Collegiate Educational Research, University of Minnesota*. Report of the Committee on Educational Research for 1930-1932, Bulletin, University of Minnesota, Vol. 36, No. 1. University of Minnesota, 1933.

University of Missouri, Columbia, Missouri

Gamma Chapter of Phi Delta Kappa, University of Missouri, Columbia, Missouri, "Five Members of Gamma Chapter Receive the Ph. D. Degree from the University of Missouri in 1930," *The Gamma Chapter News Letter*, Vol. 7, pp. 3, 4, 1931.

Gamma Chapter of Phi Delta Kappa, University of Missouri, Columbia, Missouri, "Phi Delta Kappans Want Higher Degrees," *The Gamma Chapter News Letter*, Vol. 7, pp. 9, 10, 1931.

A. G. Capps and H. M. Clements, "Abstracts of Dissertations in Education Accepted by the University," *Bulletin*, Vol. 39, No. 19, Educational Series No. 85. University of Missouri, 1941.

State University of Montana, Missoula, Montana

List of Theses Accepted by the School of Education at the State University Since 1927. University of Montana, 1933.

University of Nebraska, Lincoln, Nebraska

Abstracts of Doctoral Dissertations, 1940. University of Nebraska, 1940.

Summaries of Doctoral Dissertations and Masters' Theses. Extension Division, University of Nebraska, 1937.

University of New Mexico, Albuquerque, New Mexico

Abstracts of Masters' Theses, 1917-1928, Graduate School, University of New Mexico, Bulletin No. 2, Vol. 42. University of New Mexico, 1929.

College of the City of New York, New York

Abstracts of Theses for the Degree of Master of Science in Education, 1923-1939. College of the City of New York, New York, 1940.

New York State College for Teachers, Buffalo, New York

Masters' Theses: Titles of Theses 1914-1931; Abstracts of Theses, June, 1932, Official Register of New York State College for Teachers, Vol. 17, No. 3, 1932.

"Masters' Theses, 1933-1937: an Annotated Bibliography," New York State College for Teachers, *Official Register*, Vol. 33, No. 4, 1939.

University of New York, New York

H. A. Tonne, *Index of Dissertations of the School of Education, New York University.* Rho Chapter of Phi Delta Kappa, New York University, 1930.

Rho Chapter, Phi Delta Kappa, School of Education, New York University, *List of Doctors' and Masters' Theses in Education, New York University, First Supplement, October, 1946-June, 1947.* Washington Square Library, New York University, 1948.

Abstracts of Theses Submitted in Partial Fulfillment of the Requirements

for the Degrees of Doctor of Philosophy and Doctor of Education, October 1938-June 1939. School of Education, University of New York, 1939.

University of North Carolina, Chapel Hill, North Carolina

"Research in Progress, October 1938-October 1939," *University of North Carolina Record*, No. 347, *Graduate School Series*, No. 36, 1939.

University of North Dakota, University, North Dakota

J. V. Breitwieser, "Reviews," *The School of Education Record*, Vol. 21, No. 1. University of North Dakota, 1935.

State University of Ohio, Columbus, Ohio

R. H. Eliassen, editor, "Doctors' Dissertations Under Way in Education at Ohio State University, 1930-1931," *Sigma News Letter*, Vol. 3, pp. 9-11, 1931.

Abstracts of Theses Presented by Candidates for the Master's Degree at the August Convocation, 1930. The Graduate School, Ohio State University, 1930.

"Abstracts of Dissertations Presented by Candidates for the Degree Ph. D., Summer Quarter, 1938," Graduate School, Ohio State University, 1939, *Abstracts of Doctors' Dissertations*, No. 28, 1939.

"Abstracts of Dissertations Presented by Candidates for the Degree of Doctor of Philosophy, Spring Quarter, 1938-1939," Graduate School, Ohio State University, *Abstracts of Doctoral Dissertations*, No. 30, 1939.

University of Oklahoma, Norman, Oklahoma

Duane Roller and others, *Abstracts of Theses for Higher Degrees in the Graduate School, 1932*, University of Oklahoma Bulletin, New Series, No. 598. University of Oklahoma, 1934.

"Abstracts of Theses Issue; Higher Degrees Conferred by the Graduate School in 1937," *University of Oklahoma Bulletin*, New Series, No. 780, 1939.

Oxford University, Oxford, England

Committee for Advanced Studies, Oxford University, *Abstracts of Dissertations for the Degree Ph. D., 1938.* Oxford University Press, 1939.

Pennsylvania State College, State College, Pennsylvania

C. C. Peters, *Abstracts of Studies in Education at the Pennsylvania State College.* Penn State Studies in Education, No. 12. School of Education, Pennsylvania State College, 1935.

C. C. Peters, editor, "Abstracts of Studies in Education at the Pennsylvania State College; Part IX (1940)," School of Education, Pennsylvania State College, *Studies in Education*, No. 22, 1941.

University of Pennsylvania, Philadelphia, Pennsylvania

Doctors of Philosophy of the Graduate School, 1889-1927. University of Pennsylvania, 1927.

University of Pittsburgh, Pittsburgh, Pennsylvania

C. A. Buckner, *Annotations of Theses and Dissertations in Education.* Xi of Phi Delta Kappa, School of Education, University of Pittsburgh, 1934.

"The Graduate School Abstracts of Dissertations for the Degree of Doctor of Philosophy," *University of Pittsburgh Bulletin*, Vol. 26, 1929.

"Researches in Progress, Abstracts of Theses and Bibliography of Publications," *University of Pittsburgh Bulletin*, Vol. 27, No. 3. University of Pittsburgh, 1930.

"Graduate School Abstracts of Theses, Researches Completed, and Bibliography of Publications, Vol. 16, 1940," *University of Pittsburgh Bulletin*, Vol. 37, No. 3, January, 1941.

Radcliffe College, Cambridge, Massachusetts

Graduate School of Arts and Sciences, Radcliffe College, *Summaries of Theses Accepted in Partial Fulfillment of the Requirement for the Degree Ph. D., 1935-1938.* Harvard University Press, 1938.

University of South Carolina, Columbia, South Carolina

Ree Smith, *Abstracts of Theses for Higher Degrees, 1931*, Bulletin No. 213. University of South Carolina, 1931.

University of Southern California, Los Angeles, California

F. J. Weersing, *Annotated Index of Theses and Dissertations in Education.* Supplement for 1931. School of Education, University of Southern California, 1931.

Abstracts of Dissertations for the Degree of the Ph. D. with the Titles of Theses Accepted for Masters' Degrees, 1938. University of Southern California Press, 1939.

H. W. Hill, *Abstracts of Dissertations for the Degree of Doctor of Philosophy and the Degree of Doctor of Education with the Titles of Theses Accepted for Masters' Degrees, 1940.* University of Southern California, 1941.

Southern Methodist University, Dallas, Texas

Abstracts of Masters' Theses, 1915-26, Graduate School, Bulletin No. 3, Vol. 12. Southern Methodist University, 1927.

Abstracts of Theses: Masters' Degrees in the Graduate School, No. 7, (1938-1939). Graduate School, Southern Methodist University, 1940.

Stanford University, California

Abstracts of Dissertations for the Degrees of Doctor of Philosophy and Doctor of Education, 1947-48. Stanford University, California, 1948.

Temple University, Philadelphia, Pennsylvania

Teachers College Studies in Education and Psychology (Abstracts), Bulletin, Vol. I. Temple University, 1934.

Graduate Theses and Dissertations, 1894-1940. Sullivan Memorial Library, Temple University, 1940.

University of Texas, Austin, Texas

Frederick Eby and S. E. Frost, *Titles of Graduate Theses and Dissertations Written in the Field of Education at Six Leading Educational Institutions in Texas*. University of Texas, 1934.

Tulane University, New Orleans, Louisiana

"Abstracts of Theses, 1940," Graduate School, Tulane University, *Bulletin*, Series 41, No. 15, 1941.

Vanderbilt University, Nashville, Tennessee

"Abstracts of Theses, 1939," *Bulletin of Vanderbilt University*, Vol. 39, No. 10, 1939.

University of Virginia, Charlottesville, Virginia

Abstracts of Dissertations Accepted in Partial Fulfillment of the Requirements for the Degree Ph. D., 1938. Department of Graduate Studies, University of Virginia, 1938.

State College of Washington, Pullman, Washington

W. M. Adams *et al.*, "Reviews of Theses," *The Scroll of Alpha Gamma*, pp. 17-20. Alpha Gamma of Phi Delta Kappa, State College of Washington, 1931.

University of Washington, Seattle, Washington

"Abstracts of Theses, Faculty Bibliography, and Research in Progress," University of Washington Library, *University of Washington Thesis Series*, Vol. 5. University of Washington, 1941.

University of Wisconsin, Madison, Wisconsin

Summaries of Doctoral Dissertations Submitted to the Graduate School in Partial Fulfillment of the Requirements for the Degree Ph. D., 1939, Vol. 4. Graduate School, University of Wisconsin, 1940.

University of Wyoming, Laramie, Wyoming

Graduate Students Who Have Received Advanced Degrees, with Titles of Theses, 1897-1930, Bulletin No. 4, Vol. 28, pp. 67-72. University of Wyoming, 1931.

APPENDIX II

Representative Educational Research Problems

A. The Curriculum

1. T. H. Briggs, "Research in Secondary Education," *Junior-Senior High School Clearing House*, 9: 198-205, 1934.

a. The results of programs varying in the number of subjects; b. The effect of personal associations on academic school achievement; c. The persistence of high-school learning after graduation; d. Comparison of programs and achievement of students' high-school and college careers; e. Learning outside the school; f. Plan of library classification of educational literature; g. The use of learning in other subjects in conventional curricula; h. The effects of midyear graduation; i. The later careers of "creative youth"; j. Adapting adolescent education for the dull; k. Delinquent youths in schools and courts; l. Reading on adolescent levels; m. Education of the emotions; n. The causes, degrees, and effects of emotionalized attitudes; o. The extra-curriculum; p. The effects of extensive reading in foreign language fields; q. The effects of collateral reading in English, history, science, etc.; r. The results of teaching by different methods in various subjects and on the several intellectual-maturity levels; s. Extent of retention after formal examinations.

2. O. W. Caldwell, "Research and Elementary Science Teaching," *Science Education*, 18: 65-67, 1934.

a. Accurate measurement of results; b. Criteria for selection of curriculum content; c. Grade placement of subject matter.

3. W. W. Charters, *Research Problems in Radio Education*. Chicago: National Advising Council on Radio in Education, 1934.

1. What are the criteria for selecting effective talent? 2. The study of programs to discover their points of excellence, their weaknesses, with a view to continuous improvement; 3. Investigations of the tastes, interests, needs and abilities of audiences; 4. Investigations of the vocabulary levels of audiences; 5. A study of procedures in preparing materials for presentations on the air; 6. The experience of educational and commercial stations in providing extracurricular materials for school children before and after school and during vacations needs to be assembled; 7. A study of the methods of prepar-

ing special curricular units as transportation, communication, and programs for special occasions, is desirable. Related to this is the problem of fitting the radio curriculum into the school curriculum; 8. In school programs, the placement of materials and its distribution through the grades is a fundamental but unsolved problem; 9. One of the most baffling problems in the curriculum area is to determine the educational effectiveness of programs. A constellation of studies is needed at this point; 10. What types of program interest particularly urban populations, rural people, shut-ins, and others?

4. H. R. Douglas, "The Contribution of Research to Secondary-school Curriculum Construction," *School and Society*, 32: 411-416, 1930.

a. "What might not be added to human knowledge if, in a single school, there might be tried out over a period of years a curriculum consistent with a view only to the needs of present-day living, worked out completely independently of old subjects; organization of old subject matter divisions, old traditions and old prejudices—a course of study calculated to surround the pupils of that school with opportunities for and stimuli to activities leveled directly at health and understanding of the world about us—its economic, political, and industrial institutions, its organic and inorganic content, other people and other animals and plants—at human qualities which make a real, successful democracy founded on good will and fair dealing, at abilities making for clear thinking, at those fundamental skills which are necessary for effective intercommunication, and at interests which not only make for human solidarity but also those which insure joyous and profitable expenditure of leisure."

5. Gertrude C. Ford, "Proposed Research by Business Education Association," *Journal of Business Education*, 9: 21, 34, 1934.

a. Yearbooks in the content subjects of general and vocational business education at the different levels; b. Yearbooks in the professional areas for general material and higher aspects of business education.

6. Henry Harap, "Next Steps in Curriculum-making," *Elementary School Journal*, 31: 16-24, 1930.

a. Form of courses of study; b. Use of results of learning studies; c. Grade placement; d. Adapting instruction to individual differences; e. Time allotment; f. Evaluation of courses of study.

7. Hugh Hartshorne, "Present Status of Research in Character Education," *Religious Education*, 25: 551-554, 1930.

a. Permanence of results of character education; b. Utilization of words as tools of character education; c. Transfer of character-education values.

8. V. A. C. Henmon, "The Function, Value, and Future of Educational Research in Colleges and Universities," *Journal of Educational Research*, 27: 493-502, 1934.

a. Curriculum; b. Objectives; c. Methods of instruction.

9. L. T. Hopkins, "The Function of Research in Public School Home Economics," *Journal of Home Economics*, 22: 358-364, 1930.

10. G. C. Jensen, "Problems of Commercial Education," *Balance Sheet*, 11: 174, 178, 1930.

a. Placing of proper persons in jobs by means of high-school recommendations of fit students; b. Relation of commercial community needs to commercial school programs.

11. C. A. Jessen, *Needed Research in Secondary Education*. Washington, D. C.: United States Office of Education, 1938, Bulletin, 1937, No. 28

A listing and analysis of problems suggested in and coming out of the twenty-eight reports of the National Survey of Secondary Education.

12. B. L. Johnson, *The Secondary School Library*, pp. 108-110, National Survey of Secondary Education, Monograph No. 17. Washington, D. C.: United States Office of Education, 1933.

a. Effect of library devices and activities on use of library materials and on the reading habits of pupils; b. Effect of newer methods of classroom teaching on use of the library; c. Determination of adequate qualitative as well as quantitative standards for school library service; d. Relation of the library to the study hall; e. Relation of the school library to the public library; f. Selection of books; g. Instruction in the use of books; h. Relation of teachers to the library.

13. R. S. Lynd, *Knowledge for What?* Princeton, N. J.: Princeton University Press, 1939, pp. 208-249.

Stated as Hypotheses for Study

1. There is no way in which our culture can grow in central serviceability to its people without a large and pervasive extension of planning and control to many areas now left to casual individual initiative; 2. If democracy is to continue as the active guiding principle for culture, it will be necessary to extend it markedly as an efficient reality in government, industry, and other areas of living; 3. Private capitalism does not now operate, and probably cannot be made to operate, to assure the amount of general welfare to which the present stage of our technological status and intelligence entitle us; and other ways of managing an economy need therefore to be explored; 4. The body of fact and theory around the highly dynamic situation of class conflict will have to be much more realistically and centrally considered, if social science is to deal adequately with current institutions; 5. The chance for the survival of democracy and the prospect of increased human welfare would be enhanced by explicit recognition of the fact that men are unequal; by the discovery and elimination of cultural causes of inequality; and, where the causes of inequality are primarily biological, by the reconstructing of the culture to adjust freedom and responsibility to ability; 6. The chance of securing more coherent, constructive behavior from persons depends upon recognizing the large degree of irrationality that is natural to them and upon

structuring the culture actively to support and encourage intelligent types of behavior, including inevitably opportunity for creative, spontaneous expression of emotion; 7. If major changes are required in order to cope with present problems in our culture, it is impossible to rely primarily upon popular education to effect such changes; 8. American culture, if it is to be creative in the personalities of those who live it, needs to discover and to build prominently into its structure a care of richly evocative common purposes which have meaning in terms of the deep personality needs of the great mass of the people; 9. It is possible to build a culture that in all its institutions will play down the need for and the possibility of war; 10. Since urban living operates seriously at present to confuse and to devitalize our culture, science needs to discover ways to knit these loose population masses into living communities of interest, before this degenerating tendency renders the culture impotent; 11. It is necessary to structure into a complex culture like ours a congruent hospitality to change in all institutional areas, in order to prevent the continuous disruption of the culture by changes that occur in single areas; 12. Social science cannot perform its function, if the culture constrains it at certain points in ways foreign to the spirit of science.

14. C. H. McCloy, "Needed Research in the Field of Program in Physical Education," *Research Quarterly of the American Physical Education Association*, 2: 78-84, 1931.

a. Criteria for instructional material; b. The individual; c. Application of principles of mechanics to progression in physical activities; d. Psychology of fundamental teaching procedure; e. Techniques of measurement, classification, and marking.

15. C. H. McCloy, "Research in Athletics for Girls and Women," *Research Quarterly of the American Physical Educational Association*, 3: 101-104, 1932.

a. Causes of harm in harmful exercises and competition; b. Educational and emotional effects of athletic competition; c. Organization and teaching of activities having leisure-time carry-over values; d. Studies in dynamic body mechanics; e. Scientific basis of scoring systems; f. Measurement of "athletic intelligence."

16. W. E. Peik, "Curriculum Problems in Teacher Education," in *Encyclopedia of Educational Research*. New York: The Macmillan Company, 1941, pp. 1239 ff.

17. W. H. Sewell, *The Construction and Standardization of a Scale for the Measurement of the Social-Economic Status of Oklahoma Farm Families*. Technical Bulletin No. 9. Agricultural Experiment Stations, Oklahoma Agricultural and Mechanical College, 1940.

Seven problems involved in the making of a scale for the measurement of farm family social-economic status.

18. Dora V. Smith, *Instruction in English*. National Survey of Secondary

Education, Monograph No. 20. Washington, D. C.: United States Office of Education, 1933, p. 88.

a. How far does the present program in composition and in literature meet the present or the future needs of adolescent boys or girls? b. To what extent does the present program in English grammar influence speech and writing? What is its relative importance in an overcrowded program of instruction? c. To what objectives other than mere correctness should the composition course contribute? d. Granted that a pupil is of low intelligence and has but a year or two to remain in school, what program of English instruction will contribute most to his future welfare and efficiency? e. What is preparation for college; that is, what are the actual demands of higher institutions? To what extent should they dominate secondary school practice? f. Is there a common body of literary materials with which all pupils should be familiar?

19. DeForest Stull, "Needed Studies in the Field of Educational Geography," *Teachers College Records*, 33: 416-421, 1932.

a. What are the fundamental principles of geography? b. What content for elementary schools is necessary for the realization of the citizenship aim? c. What should be the grade placement of curriculum materials in geography?

20. A. S. Taylor, "Curricular Research is Urgently Needed," *Junior College Journal*, 3: 246-248, 1933.

a. Are the aims rooted in national or narrowly localistic and superficial educational philosophy? b. Do the aims meet community needs and sentiment or demands of remote agencies; for example, state universities? c. Are curricular offerings governed by dictates of the community, higher institutions, or tradition? d. Are enrollments in non-college preparatory or terminal curricula increasing or decreasing?

21. C. W. Washburne, "Needed Research in Curriculum Building," *Journal of Educational Research*, 21: 221-223, 1930.

a. Means of socialization; b. Provision for individual differences; c. Method in curriculum-making; d. Use of children's natural and specialized interests; e. Integration of social and individual life.

B. Teacher Education

1. A. S. Barr, "Research and the Professional Education of Teachers," *Journal of Educational Research*, 27: 364-366, 1934.

a. How many new teachers per year, subject, and grade can the profession absorb? b. What is the present status of the unemployment of teachers? c. How many of the present unemployed teachers are bona fide teachers legally certified to teach and previously employed in the profession? d. How many of the present unemployed teachers are physically, socially, and emotionally qualified to teach? e. What are the physical, intellectual, social, and emotional qualities prerequisite to teaching success? f. What subject com-

binations are teachers most frequently called upon to teach? g. How much education should a teacher have? h. Recognizing that teachers are expected to exercise a certain amount of social and civic leadership, how well qualified is the average teacher, employed and unemployed, for this responsibility? i. What are the objectives of teacher education?

2. K. W. Bigelow, *The Commission on Teacher Education: A Brief Statement of Its Origin and Scope*. Washington, D. C.: American Council on Education, 1940.

a. What should be included among the basic objectives of teacher education? b. How may the teacher's total education, on both preservice and in-service levels and with general or specialized emphases, best be planned and integrated? c. How may the teacher gain effective understanding of child nature and the process of human development, together with competence in applying that understanding in relations with pupils and associates? d. How may the teacher grow in understanding and grasp of the social scene, in ability to share democratically in the life of the community, and in skill in fostering the local integration of school and community living? e. What firsthand experiences—with children, with professional associates, in society at large, through travel, and the like—ought to be included in the education of teachers and how should these be related to formal reading and the classroom experience? f. What creative opportunities through the arts ought to be part of teacher education and what is their relation to other aspects of the program? g. How may candidates for teaching careers be more intelligently recruited and selected? h. How may guidance best be provided to aid teachers, again at both preservice and in-service levels, in the attainment of an inclusive personal and professional adjustment? i. How may democratic procedures of administration be used in colleges and school systems to develop responsible personality? j. By what means, practice teaching or other experiences, may prospective teachers be most helpfully inducted into the profession? k. How may prospective and active teachers be most effectively stirred to take personal responsibility for their own continuous development and aided in planning to this end? l. How may the activities of various types of institution and agency concerned with general and teacher education be more effectively articulated through cooperation? m. How may certification practices be improved? n. In what ways may superior individuals be attracted to the profession and made available to America's schools?

3. H. A. Brown, "Some Unsolved Problems of Teacher Preparation," *Educational Administration and Supervision*, 17: 590-602, 1931.

a. Curriculum; b. Practice teaching; c. Supply and demand for teachers; d. Functions; e. Standards.

4. W. S. Deffenbaugh and W. H. Zeigel, *Selection and Appointment of Teachers*, p. 115. National Survey of Secondary Education, Monograph No.

12. Washington, D. C.: United States Office of Education, 1933, p. 115.

a. What constitutes teaching success? b. How may the success of teach-

ers in service be measured? c. How may the future success of inexperienced teachers be predicted?

5. Educational Events. "The Minnesota Conference on Teacher-Training Problems," *School and Society*, 31: 639-640, 1930.

a. The organization of subject-matter content; b. The relation of subject matter to professional training; c. The five-year curriculum for high-school teachers; d. The coordination of teacher-training agencies.

6. E. S. Evenden, "Summary and Interpretation," pp. 247-253, *National Survey of the Education of Teachers*. Washington, D. C.: United States Office of Education, 1935, Vol. VI, Bulletin, 1933, No. 10.

a. To define good teaching in various types of positions and to develop more accurate means of measuring it; b. To make educational leaders aware of the state's responsibility for developing a long-term plan for the education of its teachers and for promoting systematic publicity campaign to acquaint patrons and teachers with its provisions; c. To obtain greater uniformity in permanent records about the education and the employment of teachers; d. To remove at once the professionally demoralizing lack of adjustment in many states between supply and demand among teachers; e. To persuade each state to establish dates by which all teachers in service whose preparation is below the accepted standard for the state would be expected to meet the current standards; f. To regulate the supply of prospective teachers by raising standards through selective admission of students to curricula for teachers; g. To provide large numbers of teachers better and more specifically prepared for rural schools; h. To provide for more and better-prepared teachers for the Negro schools in those states in which separate schools are maintained for Negroes; i. To develop greater interest in the distinctly professional elements in the education of teachers; j. To make sure that all prospective teachers possess at least the "safety minimum" amount of teaching skill before being certificated; k. To adjust curricula for teachers to the work of the junior colleges especially in those states in which the minimum standard of preparation for elementary teachers does not exceed the junior college level; l. To promote the realization that the schools will be required to take a heavier responsibility for the enjoyable and constructive use of increased amounts of leisure; m. To persuade states which have not already done so to adopt systems of restricted certification which will indicate very specifically the kinds of positions for which the teacher is prepared and which will restrict the teacher's employment to those positions; n. To develop and maintain in each state lists of institutions "approved" for the preparation of teachers for each type of position for which the state issues certificates; o. To adopt standards and regulations which will make sure that the courses in all curricula for teachers are taught by staff members who are adequately prepared—scholastically and professionally—and who are genuinely interested in education and in the education of teachers; p. To raise standards for the preparation of all teachers and to control the supply of new teachers by obtaining from all institutions on the approved list—public and private—

cooperation in developing the program and in carrying out its provisions; q. To improve the community status—prestige—of the teacher; r. To develop upon a nation-wide basis such an understanding of the significance of education that ways and means will be found and approved for restoring recent educational losses and for adding new educational services; s. To procure in a majority of the states the legislation or the constitutional amendments essential to the reorganization of the state departments of education; t. To maintain in each state a continuing survey of its teaching personnel in order to meet its teacher-training obligations wisely.

7. J. W. Withers, "Important Problems for Research in the Education of Teachers," *School and Society*, 33: 613-617, 1931.

a. What effect are they really having on supervision and instruction? b. To what extent are these results wisely incorporated in the curricula and courses of study of present programs and practices in the education of teachers? c. Are we making the most intelligent and effective use of research results of the last twenty-five years in the preparation of teachers and the actual education of children?

C. Administration

1. M. M. Chambers, "Needed Studies in Educational Administration," *Educational Administration and Supervision*, 19: 268-274, 1933.

a. Statutes and judicial decisions in every state governing the employment policies of the public school corporations; b. Relation of education to unworthy interests in business and politics; c. Limitations upon the application of principles of business and industrial management to the problems of educational administration; d. Should education be one of the major coordinate departments of government, along with the executive, judicial, and legislative branches?

2. O. L. Chapman, "Six Problems in Education," *Nation's Schools*, 14: 17-18, 1934.

a. Restatement of objectives; b. Revamping of tax systems; c. District organization; d. Teacher training; e. Public relations and education of the public to the program of the school.

3. J. K. Norton, "Ph. D. and Ed. D. Adventures in School Administration," *Teachers College Records*, 36: 207-212, 1934.

a. The organization and articulation of the administrative units of the American school system; b. Relationship of laymen and lay organizations to professional educators in determining the content and activities of the school curriculum; c. The relation of education to other areas of government, functionally and structurally; d. Determination of state funds for local education; e. Nature, causes, effects, and promoters of demands and pressures on the public schools, and methods of dealing with them.

4. F. T. Spaulding, *et al.*, "A List of Needed Investigations of School

Organizations," *The Reorganization of Secondary Education*. National Survey of Secondary Education, Monograph No. 5. Washington, D. C.: United States Office of Education, 1933, pp. 421-423.

a. The validation of a system of rating the organization of an individual secondary school; b. Analysis of the extent to which effectiveness in one major phase of organization is dependent upon special effectiveness in one or more other phases of organization; c. More exact analysis of typical organization of conventionally organized schools, as a means of gauging the effects of reorganization; d. Detailed analysis of the organization of outstanding private schools, as contrasted with the organization of public schools; e. Study of the organization of private secondary schools used as agencies of public instruction, as contrasted with the organization of comparable public schools; f. Detailed investigation of the factors which cause individual secondary schools either notably to exceed or notably to fall below the norms for organization of schools of their type and size; g. Detailed study of methods by which schools necessarily handicapped either in size or in type of organization may improve their organization; h. Further evaluations of various types of organization in schools falling in enrollment groups not adequately represented in the present study; in particular, study of schools separately classified; i. More exact analysis of the differences in organization between large and small schools by a segregation of schools in type groups and a determination of the differences between large and small schools common to all the type groups; j. Investigation of the maximum effective size of schools under various types of organization; k. Study of the relationship between effectiveness of organization and per-pupil outlay for items immediately associated with organization; l. Study of the relative holding power of schools of various sizes and types over a period of years; m. Study of the relationship between the sources of support for extracurricular activities and the scope of the extracurriculum; n. Investigation of the effects of extreme departmentalization in the junior high school grades; o. Comparison of both the administrative and the educational effects of various types of curriculum organization.

5. O. F. Weber, *Problems in Public School Administration*. New York: D. Appleton-Century Company, 1930.

A critical evaluation of Thorndike's findings in his *Adult Learning*.

6. W. L. Wrinkle, *Workshop in Secondary Education*. Greeley, Colo.: Colorado State College of Education, Summer, 1940.

a. Interpreting the school to the community; b. Better understanding of community needs and school problems.

D. Finance

1. W. G. Carr, "Some Crucial Problems in Rural Education," *Journal of the National Education Association*, 19: 282-284, 1930.

2. L. V. Koos, *et al.*, "Investigating the 'Unknowns' of School Finance," *School Review*, 40: 91-92, 1932.

a. Why has expenditure for education increased so markedly? b. Where will present tendencies lead? c. How much public expenditure is really needed? d. What can we afford to spend for education? e. Why do expenditures vary so widely from place to place? f. What advantages are obtained by communities spending exceptionally large amounts for education? g. What disadvantages are suffered by communities spending exceptionally small amounts for education? h. Under present financing systems, how is the tax burden for education distributed? i. What changes in taxation and in state and federal aid would bring about a more defensible distribution of burden? j. How can we secure greater value for what we spend? k. How can we effect economies? l. To what degree, if any, are we wasting money through the overeducation of some boys and girls? m. What is the extent of waste suffered through failure to give some individuals sufficient education to develop their real potentialities? n. How should education be dealt with during business depressions? o. What place is indebtedness now taking in educational finance? p. What place should it take? q. How can the public be continually informed on the pertinent questions of educational finance? r. What are the conditions that should determine salaries of teachers?

3. P. R. Mort, *Research Problems in School Finance*. Washington, D. C.: American Council on Education, 1933.

a. Financial implications of the principles underlying American education; b. Improvement of expenditure measurement in school finance; c. Management of school income; d. Securing adequate returns for school expenditures; e. Improvement of budgeting, accounting, auditing, and reporting procedures; f. Importance of private support of education; g. Responsibilities of the state in the support of public education; h. Responsibilities of the federal government in the support of public education; i. Development of efficient local tax districts; j. Controls and limitations on school taxation and expenditures; k. Stabilization of school support.

E. Teaching

1. H. H. Anderson, "Research in Mental Hygiene," *Childhood Education*, 7: 423-427, 1931.

a. Does departmental teaching render unnecessary and impossible the consideration of personality development of school children? b. What is the cost to the mental health of the children of the school's failure to develop personality? c. Are whispering, unpermitted talking, and writing notes evidence of thwarting of integrative processes by teachers or by the system?

2. W. L. Beauchamp, *Instruction in Science*. National Survey of Secondary Education, Monograph No. 22. Washington, D. C.: United States Office of Education, 1933, Chap. VIII.

a. The topical method; b. The committee method; c. The size of the learning unit; d. The use of several textbooks; e. The use of scrapbooks, posters, and related materials; f. The use of guide sheets; g. The use of the pupil workbook; h. The unit method of instruction; i. Initiation of new

work; j. The use of project method; k. Methods of demonstration; l. Methods of recording laboratory exercises; m. The use of detailed or general laboratory directions; n. The use of visual aids; o. Training in scientific thinking.

3. W. G. Carr, "New Angle of Attack Needed in Class Size Research," *Nation's Schools*, 10: 27-30, 1932.

a. Effect of large classes on pupil health; b. Effects of more classes or longer periods on the teacher, pupils, and instruction; c. Effect of large classes on mental hygiene of pupils; d. Do teachers in small classes know their pupils better than teachers in large classes, and, if so, how do they utilize this knowledge? e. Parents' preferences for large or small classes and reasons for them; f. Effect of large classes on failure, retardation, and acceleration; g. View of practicing physicians, psychologists, and psychiatrists on the class-size problem.

4. W. W. Charters, *Research Problems in Radio Education*. Chicago: National Advisory Council on Radio in Education, 1934.

1. Much lost motion will be prevented if we know what materials are best suited to treatment over the radio. Music undoubtedly is favorably situated; but are arithmetic, geography, and art lessons so effective that they should be encouraged? Radio lessons will eventually settle in some areas in which they show demonstrable usefulness. The assembly of experience, experimentation, and measurement is now appropriate; 2. What and how much preparation for radio lessons is now made by teachers and what are desirable types of preparation? One product of this study may well be a manual of specifications for teachers. Indeed there is great need for simple manuals for teachers to supplement the directions for specific programs prepared by the broadcaster; 3. What are the best techniques to be used while the radio lessons are in progress? To assemble and publish present practices provides a simple and significant study; 4. What may effectively be done by teacher and pupils after the radio lesson has been taught? 5. What in the opinion of teachers is the value of radio lessons? Is it merely a novelty to be discarded when the newness has worn off, or has it a permanent place in the classroom and under what conditions? A study of the judgment of teachers and administrators is here indicated as an initial project; 6. The collection, analysis, and evaluation of all supplementary aids for radio lessons need to be made, printed, and distributed to program directors.

5. F. D. Curtis, "Some Contributions of Research to Practices in Science Teaching," *Science Education*, 16: 266-273, 1932.

a. Analyses for the purpose of determining a wider variety of profitable classroom, laboratory, and extraclassroom activities, devices, and practices distinct from teaching methods, with objective determinations of the relative values of these; b. Construction of standardized group tests for measuring a large number of outcomes of instruction other than a knowledge of subject matter; c. Synthetic curricular researches aiming to combine and utilize in an objective way the findings of miscellaneous related curricular studies.

6. Bess Goodykoontz, "Opportunities for the Classroom Teacher as a Research Worker," *School Life*, 15: 161-163, 1930.

a. Study of methods of teaching; b. Analysis of steps of learning; c. Which is better—long or short daily assignments? d. Shall primary teachers use print or script? e. Shall English teachers have a recommended or a required reading list? f. Does an open-book discussion in science yield better results than an individual-study period? g. Shall pupils in algebra be permitted to progress individually or by groups? h. Study of curriculum materials; i. Case studies of pupils' behavior.

7. G. N. Kefauver and H. C. Hand, "Needed Research in Guidance," *Junior-Senior High School Clearing House*, 8: 40-42, 1933.

a. To what extent are the interests and behavior of students of different types affected by experiences in the various courses? b. Systematic analyses of the need for guidance; c. Definition of problems of guidance; d. Discovery and invention of new methods in guidance; e. Effect of existing guidance procedures.

8. F. H. Lund, "Educational Research in the Field of Emotion," *Educational Record*, 12: 138-143, 1931.

a. Is interest, or drive, or incentive an acquired or native trait? b. Understanding of the autonomic nervous system; c. Determination of the relative effectiveness of different forms of motivation in use in the schoolroom.

9. S. S. Mayo, "Neglected Phases of Ability Grouping in High School," *American School Board Journal*, 81: 48, 1930.

a. Differentiation of subject matter; b. Adaptation of teaching methods.

10. Ruth E. Pearson, "Pre-School Personality Research," *American Journal of Sociology*, 37: 584-595, 1931.

a. What a given person does and feels in response to others in all group situations which he habitually meets; b. Variations in group behavior among children of the same age and analyses of the processes back of the behavior.

11. D. A. Prescott, *Emotion and the Educative Process*. Washington, D. C.: American Council on Education, 1938, Chaps. X and XI, pp. 197-281.

1. Understanding the affective characteristics of pupils; 2. Educativeness of school curricula; 3. Nature of curricula and experiences; 4. Appropriateness of curricula experiences to personality needs of children; 5. Appropriateness of curricula materials to the abilities of children; 6. Motivation of school tasks and curricula experiences; 7. Psychological appropriateness of the organization of material; 8. Administrative considerations and conditions under which schools must be operated; 9. Does the profession satisfy the personality needs of teachers? 10. Maladjusted teachers as a serious personnel problem; 11. Nature of personal relationship; 12. Personal relationships in educational institutions; 13. Characteristics of teachers; 14. Functional basis of pupil-teacher relationship; 15. Problems developing from inter-pupil relationship; 16. Affective deviates.

12. W. L. Wrinkle, *Workshop in Secondary Education*, Colorado State College of Education, Summer, 1940.

a. Setting up a program to make reading more effective in the tenth grade; b. Evaluating learnings in science of junior high-school pupils; c. Methods of teaching science; d. Teaching mathematics for transfer to nonmathematical situations.

F. Supervision

1. A. S. Barr, *An Introduction to the Scientific Study of Classroom Supervision*, Chapter VIII. New York: D. Appleton-Century Company, 1931.

a. Data-gathering devices of supervision; b. Principles of learning, teaching, and supervising; c. Translation of the principles of learning, teaching, and supervision into learning, teaching, and supervising practices; d. Relative effectiveness of various supervisory devices; e. Evaluation of the products of supervision; f. Factors influencing the attitude of teachers toward supervision; g. Motivation of supervision; h. Spread of training in supervision; i. Characteristic differences in the teaching performance of good and poor supervisors.

2. A. S. Barr, "Planning the Year's Program," *Journal of Educational Research*, 22: 140-141, 1930.

a. The objectives of education; b. Selection and organization of subject matter; c. Measurement.

3. A. S. Barr, "The Scientific Study of Classroom Supervision," *Journal of Educational Research*, 22: 219-222, 1930.

a. Validation of data-gathering devices; b. Scientific conception of the program of supervision as a whole; c. Mental processes involved in the different types of learning to teach; d. Objective means of measuring the results of supervision.

4. T. H. Briggs, "Supervisory Experimentation," *School Review*, 41: 737-746, 1933.

a. Value of topic assignments to small groups organized with a pupil chairman to prepare extended reports; b. Merits of a pupil-discussion versus a textbook recitation procedure; c. Evaluation of directed study; d. Effect on hearing a radio while studying; e. Comparison of written work prepared at home with that done at school; f. Effectiveness of diagnostic tests followed by remedial reading; g. Comparison of textbook-demonstration, and textbook experimentation (by pupils) methods in science.

5. L. J. Brueckner, *et al.*, *The Superintendent Surveys Supervision*. Eighth Yearbook of the Department of Superintendence. Washington, D. C.: National Education Association, 1930, Chap. VII.

a. Consideration of the supervisor's philosophy of the job and of his skill; b. Use of teacher-rating blanks to measure improvement in teaching;

c. Measuring changes in teaching method and skill; d. Measuring changes in levels of teaching; e. Elimination of errors in teaching procedures; f. Elimination of teachers' difficulties; g. Evaluation of supervision through semi-objective rating devices; h. Improvement in the character of the materials of instruction; i. Objective analysis of activities in the classroom; j. Objective analysis of characteristics of pupil behavior as indices of the quality of instruction.

6. W. H. Burton, "Probable Next Steps in the Progress of Supervision," *Educational Method*, 9: 402-406, 1930.

a. The administrative organization of city systems with special reference to the provisions made for supervision; b. The worth of a given teacher's classroom technique; c. The preservice training of classroom teachers.

7. J. C. Morrison and others, *Current Problems of Supervisors*. Third Yearbook of the Department of Supervisors and Directors of Instruction of the National Education Association. New York: Teachers College, Columbia University, 1930.

a. Aims and methods of teaching; b. Instructional materials, supplies, and equipment; c. Classroom organization; d. Professional growth in service.

8. W. L. Wrinkle, *Workshop in Secondary Education*. Greeley, Colo.: Colorado State College of Education, Summer, 1940.

a. A centralized radio system as an educational device to aid teachers and administration; b. Improvement of the audio-visual aids in the school; c. Direction of a comparative study of the curriculum of the secondary school; d. A functional program in reading, English, and social studies in the junior high school; e. A program for reading improvement of ninth grade pupils; f. Improvement of reading comprehension in secondary school content courses; g. A guidance program for a small high school.

APPENDIX III

Educational Research Sources

A. Reference Books

1. *American Junior Colleges*, W. C. Eells. Washington, D. C.: American Council on Education, 1940.
2. *American Universities and Colleges*, C. S. Marsh. Washington, D. C.: American Council on Education, 1940.
3. *American Year Book*. New York: D. Appleton-Century Company, 1911-1920; The Macmillan Company, 1926-1927; Doubleday, Doran and Company, 1928; American Year Book Corporation, 1929-1935; Thomas Nelson & Sons, 1937-1942.
4. *Basic Reference Books*, Louis Shores. Chicago: American Library Association, 1939.
5. *Bibliographic Index: A Cumulative Bibliography of Bibliographies*. New York: H. W. Wilson Company, 1938 to date.
6. *Bibliographies and Summaries in Education*, W. S. Monroe and Louis Shores. New York: H. W. Wilson Company, 1936.
7. *Book Review Digest*. New York: H. W. Wilson Company, 1949.
8. *College Blue Book*, 1939, H. W. Hurt and Harriet Hurt. De Land, Fla.: College Blue Book, 1924-1949.
9. *Cumulative Book Index*, Mary Burnham. New York: H. W. Wilson Company, 1928-1949.
10. *A Cyclopedia of Education*, Paul Monroe. New York: The Macmillan Company, 1913, Vols. I-V.
11. *A Dictionary of Philosophy and Psychology*, J. M. Baldwin. New York: The Macmillan Company, 1905, Vols. I, II, III.
12. *Educational Directory*, Part I, "State and County School Officers"; Part II, "City School Officers"; Part III, "Colleges and Universities"; Part IV, "Educational Associations and Directories," issued annually as Bulletin No. 1. Washington, D. C.: United States Office of Education, 1912-1948.
13. *Education Index*. New York: H. W. Wilson Company, 1929 to date.
14. *Encyclopedia Americana*. New York: Encyclopedia Americana Corporation, 1939, Vols. I-XXX.

15. *Encyclopedia and Dictionary of Education*, Foster Watson. New York: Pitman Publishing Company, 1921, Vols. I-IV.
16. *Encyclopaedia Britannica*. Chicago: Encyclopaedia Britannica, Inc., 1929 to date.
17. *Encyclopedia of Educational Research*, W. S. Monroe, American Educational Research Association. New York: The Macmillan Company, 1941.
18. *Find It Yourself*, Elizabeth Scripture and M. R. Greer. New York: H. W. Wilson Company, 1927.
19. *Guide to Reference Books*, I. G. Mudge. Chicago: American Library Association, 1936; *Reference Books of 1935-1937*. Chicago: American Library Association, 1929; *Reference Books of 1938-1940*, C. M. Winchell. Chicago: American Library Association, 1941, etc.
20. *A Handbook of Private Schools*, Porter Sargent. Boston: The author, 1940.
21. *How to Locate Educational Information and Data*, Carter Alexander. New York: Teachers College, Columbia University, 1941.
22. *International Index to Periodicals*. New York: H. W. Wilson Company, 1949.
23. *New International Encyclopedia*. New York: Dodd, Mead and Company, 1922-1949.
24. *Leaders in Education*, J. M. Cattell, Jacques Cattell, and E. E. Ross. Lancaster, Pa.: Science Press, 1941.
25. *Library Key*, Zaidee Brown. New York: H. W. Wilson Company, 1939.
26. *List of Educational Subject Headings*, L. B. Voegelien. Columbus, Ohio: Ohio State University Press, 1928 to date.
27. *Loyola Educational Index*. Chicago: Loyola University Press, 1928.
28. *Patterson's College and School Directory*. Chicago: American Educational Company, 1904 to date.
29. *Poole's Index to Periodical Literature*, and supplements. Boston: Houghton Mifflin Company, 1802-1907.
30. *Psychological Abstracts*. New York: American Psychological Association, 1937 to date.
31. *Psychological Index*. Columbus, Ohio: Psychological Review Company, 1895-1949.
32. *Publishers' Weekly*. New York: R. R. Bowker, 1949.
33. *Readers' Guide to Periodical Literature*. New York: H. W. Wilson Company, 1900 to date.
34. *Review of Educational Research*, 1931 to date (three-year cycles).
35. *Statesman's Yearbook*. New York: The Macmillan Company, 1864 to date.
36. *Subject Heads in Education*, Clyde Pettus. New York: H. W. Wilson Company, 1938.

37. *Supplements to the United States Catalogue*. New York: H. W. Wilson Company.
38. *Ten Years of Educational Research, 1918-1928*. Urbana, Ill.: University of Illinois, 1928.
39. *Union List of Serials in Libraries of the United States and Canada*, Supplements 1931 and 1933. New York: H. W. Wilson Company, 1931, 1933.
40. *United States Catalogue*. New York: H. W. Wilson Company, 1928 to date.
41. *University of Illinois Bulletin*, Vol. 25, No. 51; Bureau of Educational Research Bulletin, No. 50. Urbana, Ill.: University of Illinois, 1919-1928.
42. *Who's Who in America*. Chicago: A. N. Marquis Company, Biennial, 1899 to date.
43. *Who's Who in American Education*. New York: Who's Who in American Education, 1928 to date.
44. *World Almanac, World-Telegram*. New York: Press Publishing Company, 1868 to date.

B. Research Monograph Series

1. Bureau of Educational Research Monographs. Columbus, Ohio: Ohio State University.
2. Bureau of Educational Reference and Research Monographs. Ann Arbor, Mich.: University of Michigan.
3. Child Development Monographs. New York: Child Development Institute, Columbia University.
4. Education Monographs. Minneapolis, Minn.: College of Education, University of Minnesota.
5. Educational Monographs. Emporia, Kan.: State Teachers College.
6. *Educational Research Bulletin*. Washington, D. C.: Catholic University of America.
7. *Educational Research Bulletin*. Columbus, Ohio.: Ohio State University.
8. Educational Research Monographs. Columbus, Ohio: Ohio State University.
9. Genetic Psychology Monographs. Worcester, Mass.: Clark University.
10. Journal of Educational Research Monographs. Bloomington, Ill.: Public School Publishing Company.
11. Monographs in Education. Cambridge, Mass.: Harvard University.
12. Monographs. Iowa City, Iowa: State University of Iowa.
13. National Research Council Monographs. Washington, D. C.
14. Psychological Monographs. Princeton, N. J.: Princeton University.
15. Supplementary Educational Monographs. Chicago, Ill.: University of Chicago.

16. *Summary of Literature in Psychology*, Carl Murchison. Worcester, Mass.: Clark University Press.
17. Terminal Education Monographs. Washington, D. C.: Commission on Junior College Terminal Education.
18. Vocational Monograph Series. Washington, D. C.: American Council on Education.
19. University Research Monographs. Baltimore, Md.: Warwick and York.

C. Current Educational Journals

See the latest issue of the Educational Press Association of America, Yearbook, *Classified List of Educational Periodicals*. Washington, D. C.: The Association, 1925 to date.

Some indication of the relative value of the principal educational journals as sources of research material is given by the results of inquiries among students of education at Stanford University and a group of high-school and elementary principals and classroom teachers on the job.¹ The results of the investigations seem to show that *School and Society* heads the list of twenty-four journals named as "read," "most helpful," "read regularly," or "read most." Six other magazines following in rank order are *School Review*, *Educational Review*, *Journal of the National Education Association*, *American Educational Digest*, *Elementary School Journal*, and *Educational Administration and Supervision*.

A. SELECTED GENERAL LIST

1. *American Journal of Psychology*.
2. *American School Board Journal*.
3. *American Educational Digest*.
4. *California Journal of Secondary Education*.
5. *Catholic Educational Review*.
6. *Chicago Schools Journal*.
7. *Childhood Education*.
8. *Child Study*.
9. *Child-Welfare Magazine*.
10. *Clearing House*.
11. *College English*.
12. *Curriculum Journal*.
13. *Detroit Educational Journal*.

¹ J. L. LaPoe, "The Senior High School Principals' Professional Magazines," *Educational Research Bulletin*, VI: 259-261, 1927; E. L. Kelly and F. L. Whitney, "Educational Magazines Read by Five Hundred Elementary School Principals and Classroom Teachers," *Elementary School Journal*, 29: 176-180, 1928; W. C. Eells, "What Professional Magazines Do Prospective Educators Read?" *School and Society*, 29: 446-448, 1929; W. C. Eells, "Are Educational Journals Worth Reading?" *Journal of the National Education Association*, 19: 159-160, 1930.

14. *Education.*
15. *Educational Abstracts.*
16. *Education Digest.*
17. *Educational Administration and Supervision.*
18. *Educational Forum.*
19. *Educational Law and Administration.*
20. *Educational Method.*
21. *Educational Record.*
22. *Educational Research Bulletin.*
23. *Educational Review.*
24. *Educational Screen.*
25. *Elementary English Review.*
26. *Elementary School Journal.* (Selected list of current publications monthly.)
27. *English Journal.*
28. *Frontiers of Democracy.*
29. *High Points.*
30. *Industrial-Arts Magazine.*
31. *Industrial Arts and Vocational Education.*
32. *Journal of Adult Education.*
33. *Journal of Applied Psychology.*
34. *Journal of Education.*
35. *Journal of Educational Method.*
36. *Journal of Educational Psychology.*
37. *Journal of Educational Research.* (*Doctors' Studies Under Way* each January and *Bibliography on the Methodology of Educational Research* each October.)
38. *Journal of Experimental Education.*
39. *Journal of Experimental Psychology.*
40. *Journal of General Psychology.*
41. *Journal of Geography.*
42. *Journal of Higher Education.*
43. *Journal of the American Association of University Women.*
44. *Journal of the National Education Association.*
45. *Journal of Negro Education.*
46. *Journal of Psychology.*
47. *Journal of Social Hygiene.*
48. *Journal of Social Psychology.*
49. *Junior College Journal.*
50. *Junior-Senior High School Clearing House.*
51. *Loyola Digest.*
52. *Mathematics Teacher.*
53. *Mental Hygiene.*
54. *Nation's Schools.*
55. *Normal Instructor and Primary Plans.*
56. *North Central Association Quarterly.*
57. *Occupational Index.*

58. *Peabody Journal of Education.*
59. *Pedagogical Seminary and Journal of Genetic Psychology.*
60. *Personnel Journal.*
61. *Phi Delta Kappan.*
62. *Primary Education.*
63. *Progressive Education.*
64. *Psychological Abstracts.*
65. *Psychological Bulletin.*
66. *Psychological Index.*
67. *Psychological Review.*
68. *Research Quarterly of the American Association for Health, Physical Education, and Recreation.*
69. *Review of Educational Research.*
70. *School Arts Magazine.*
71. *School Executive.*
72. *School Life.*
73. *School Review.* (Selected list of current publications monthly.)
74. *School and Society.*
75. *Science Education.*
76. *Science Illustrated.*
77. *Social Frontier.*
78. *Social Education.*
79. *Social Science Abstracts* (to 1932).
80. *Sociology and Social Research.*
81. *Teachers College Record.*
82. *Teachers Journal and Abstract* (to 1932).

B. SPECIALIZED PUBLICATIONS

An outstanding periodical in each of nineteen subject-matter fields.

1. Art—*School Arts Magazine.* Worcester, Mass.: School Arts Printers Building.
2. Business Education—*Journal of Business Education.* New York: New York University.
3. Economics—*American Economic Review.* Evanston, Ill.: American Economic Association, Northwestern University.
4. English—*English Journal.* Chicago, Ill.: University of Chicago Press.
5. Foreign Languages—*Modern Language Journal.* Washington, D. C.
6. Geography—*Geographical Review.* New York: American Geographical Society.
7. History—*American Historical Review.* New York: American Historical Association.
8. Home Economics—*Journal of Home Economics.* Washington, D. C.: American Home Economics Association.
9. Industrial Arts—*Industrial Arts and Vocational Education.* Milwaukee, Wis.: Bruce Publishing Company.

10. Mathematics—*Mathematics Teacher*. New York: The Mathematics Teacher.
11. Modern Language—*Modern Language Journal*. Menasha, Wis.: George Banta Company.
12. Music—*Music Educators' Journal*. Chicago, Ill.: National Conference of Music Supervisors.
13. Physical Education—*Journal of Health and Physical Education*. Ann Arbor, Mich.: American Association for Health, Physical Education, and Recreation.
14. Political Science—*Political Science Quarterly*. New York: Academy of Political Science, Fayerweather Hall, Columbia University.
15. Psychology—*Psychological Review*. Columbus, Ohio: American Psychological Association.
16. Religious and Character Education—*Religious Education*. Chicago, Ill.: Religious Education Association.
17. Science—*Scientific Monthly*. New York: Science Press.
18. Science Education—*Science Education*. New York: New York University.
19. Sociology—*Journal of Educational Sociology*. Washington Place, New York.

D. National, Regional, and State Education Association Publications

See *Educational Directory*, No. 1, Part IV, *Educational Associations and Directories*. Washington, D. C.: United States Office of Education. Published annually.

Selected associations which issue yearbooks, bulletins, or journals.

1. Allied Youth, Inc., *Allied Youth*. 1709 M Street, Washington, D. C.
2. American Academy of Political and Social Science, *Annals*. 3457 Walnut Street, Philadelphia 4, Pa.
3. American Association for Adult Education, *Journal of Adult Education*. 525 West 120th Street, New York 27.
4. American Association for the Advancement of Science, *Science and The Scientific Monthly*. Washington 25, D. C.
5. American Association of Collegiate Registrars, *Journal of American Association of Collegiate Registrars*. Chicago, Ill.: University of Chicago.
6. American Association of Junior Colleges, *Junior College Journal*. 1201 Nineteenth Street NW, Washington, D. C.
7. American Association of Physics Teachers, *American Journal of Physics*. 57 East Fifty-fifth Street, New York 22.
8. American Association of Schools and Departments of Journalism, *Journalism Quarterly*. Boston, Massachusetts.

9. American Association of Teachers of Spanish and Portuguese, *Hispana*. University of North Carolina, Chapel Hill, North Carolina.

10. American Association of University Professors, *Bulletin of American Association of University Professors*. 1155 Sixteenth Street NW, Washington, D. C.

11. American Association of University Women, *Journal of the American Association of University Women*. 1634 I Street NW, Washington, D. C.

12. American Council on Education, *Educational Record; American Council on Education Studies*. 744 Jackson Place NW, Washington, D. C.

13. American Economic Association, *American Economic Review*. Northwestern University, Evanston, Illinois.

14. American Educational Research Association, *Review of Educational Research*. 1201 Sixteenth Street, Washington, D. C.

15. American Federation of Teachers, *The American Teacher*. 967 Elbon Road, Cleveland Heights, Ohio.

16. American Historical Association, *American Historical Review*. Room 274, Library of Congress Index, Washington, D. C.

17. American Library Association, *Bulletin of the American Library Association*. 520 North Michigan Avenue, Chicago, Illinois.

18. American Mathematical Society, *Bulletin of the American Mathematical Society*. 531 West 116th Street, New York.

19. American Medical Association, *Journal of the American Medical Association*. 535 North Dearborn Street, Chicago, Illinois.

20. American Nurses Association, *American Journal of Nursing*. 1790 Broadway, New York.

21. American Political Science Association, *American Political Science Review*. University of Wisconsin, Madison, Wisconsin.

22. American Public Health Association, *American Journal of Public Health*. 1790 Broadway, New York.

23. American Psychological Association, *Yearbook, Psychological Bulletin, Psychological Review, Journal of Experimental Psychology, Psychological Monographs, Journal of Abnormal and Social Psychology, Psychological Abstracts, Journal of Applied Psychology, American Psychologist, Journal of Comparative Psychology, Psychological Index*. Columbia University, New York.

24. American Statistical Association, *Journal of the American Statistical Association, Statistical Association Bulletin, Biometrics Bulletin*. 1603 K Street NW, Washington, D. C.

25. American Teachers Association, Inc., *Bulletin*. State Teachers College, Montgomery, Alabama.

26. Association for Childhood Education, *Childhood Education*. 1201 Sixteenth Street NW, Washington, D. C.

27. Association of American Colleges, *Bulletin*. 744 Jackson Place, Washington, D. C.

28. Association of American Universities, *Journal of Proceedings and Addresses*. University of North Carolina, Chapel Hill, North Carolina.
29. Association of Colleges and Secondary Schools for Negroes, *Annual Proceedings*. Southern University, Scotlandville, Louisiana.
30. Child Study Association of America, Inc., *Child Study*. 221 West Fifty-seventh Street, New York.
31. Eastern Commercial Teachers Association, *Yearbook, American Business Education Digest*. Newark, New Jersey.
32. Eastern States Association of Professional Schools for Teachers, *Teacher-Education Journal*. Wilson Teachers College, Washington, D. C.
33. Hispanic Society of America, *Notes Hispanic, Handbook and Catalogues of the Collections*. New York 32.
34. Mathematical Association of America, *American Mathematical Monthly*. Oberlin, Ohio.
35. Middle States Association of Colleges and Secondary Schools, *Proceedings*. Box 352, George School, Pennsylvania.
36. Modern Language Association of America, *Quarterly*. Menasha, Wisconsin.
37. Music Teachers National Association, *Proceedings, Bulletin*. University of Missouri, Columbia, Missouri.
38. National Academy of Sciences, *Proceedings*. 2101 Constitution Avenue, Washington, D. C.
39. National Association of Biology Teachers, *American Biology Teacher*. University High School, Bloomington, Indiana.
40. National Association of Business Teacher-Training Institutions, *Bulletin*. Columbia University, New York.
41. National Association of College Women, *Journal*. 2645 Fifteenth Street NW, Washington, D. C.
42. National Association of Principals of Schools for Girls, *Proceedings*. Abbott Academy, Andover, Massachusetts.
43. National Association of Schools of Music, *Bulletin of the National Association of Schools of Music, List of Books on Music*. University of Kansas, Lawrence, Kansas.
44. National Child Labor Committee, *The American Child*. 122 East Twenty-second Street, New York.
45. National Collegiate Athletic Association, *Proceedings*. Louisiana State University, New Orleans, Louisiana.
46. National Committee for Mental Hygiene, Inc., *Mental Hygiene, Understanding the Child*. 1790 Broadway, New York.
47. National Congress of Parents and Teachers, *National Parent-Teacher Magazine*. 600 South Michigan Boulevard, Chicago, Illinois.
48. National Council for Business Education, *Journal of Business Education*. Teachers College, Columbia University, New York.

49. National Council of Geography Teachers, *Journal of Geography*. Stanford University, California.
50. National Council of Teachers of English, *College English*, *The English Journal*, *Elementary English Review*. 211 West Sixty-eighth Street, Chicago, Illinois.
51. National Council of Teachers of Mathematics, *Mathematics Teacher*, *Yearbook*. Peabody College for Teachers, Nashville, Tennessee.
52. National Education Association, *Journal of the National Education Association* and forty other yearbooks, bulletins, and journals from twenty-nine departments. 1201 Sixteenth Street NW, Washington, D. C.
53. National Federation of Business and Professional Women's Clubs, Inc., *Independent Woman*. 1819 Broadway, New York.
54. National Federation of Modern Language Teachers, *Modern Language Journal*. West Side High School, Newark, New Jersey.
55. National Geographic Society, *National Geographic Magazine*. 1146 Sixteenth Street NW, Washington, D. C.
56. National Historical Society, *Journal of American History*. 175 Fifth Avenue, New York.
57. National Organization of Public Health Nursing, *Public Health Nursing*. 1790 Broadway, New York.
58. National Recreation Association, *Recreation*. 315 Fourth Avenue, New York.
59. National Safety Council, *Public Safety*, *Safety Education*, *National Safety News*. 20 North Wacker Drive, Chicago, Illinois.
60. National Society for the Study of Education, *Yearbook*. 5835 Kimbark Avenue, Chicago 37, Illinois.
61. National Society of College Teachers of Education, *Yearbook*. State University of Iowa, Iowa City, Iowa.
62. National Student Federation of the United States of America, *NSFA Reporter*, *Weekly News Releases*. 274 Madison Avenue, New York.
63. North Central Association of Colleges and Secondary Schools, *North Central Association Quarterly*. University of Nebraska, Lincoln, Nebraska.
64. Northwestern Association of Secondary and Higher Schools, *Occasional Bulletins*, *Proceedings*. University of Oregon, Eugene, Oregon.
65. Personnel Research Federation, *Personnel Journal*. 60 East Forty-second Street, New York.
66. Phi Beta Kappa, *American Scholar*, *Key Reporter*. 15 East Forty-fourth Street, New York.
67. Phi Delta Kappa, *The Phi Delta Kappan*. Ridge Road, Homewood, Illinois.
68. Progressive Education Association, *Progressive Education*. 310 West Ninetieth Street, New York.

69. Social Science Research Council, *Annual Report, Bulletins*. 230 Park Avenue, New York.

70. Southern Association of Colleges and Secondary Schools, *Proceedings, Quarterly*. University of Chattanooga, Chattanooga, Tennessee.

71. Special Libraries Association, *Special Libraries*. 31 East Tenth Street, New York.

72. Teachers College Personnel Association, *Cooperative Personnel Program*. 109 West Market Street, Bloomington, Illinois.

73. Western Association of College and University Business Officers, *Proceedings, News Letter*. 2130 Fulton Street, San Francisco, California.

74. Western College Association, *Professional Calendar, News Letter*. Stanford University, California.

75. Workers' Education Bureau of America, *Workers' Education Bureau News Letter*. 1440 Broadway, New York.

E. Journals Issued as Organs of State Education Associations

1. *Alabama School Journal*. 21 Adams Avenue, Montgomery, Alabama.

2. *Arizona Teacher-Parent*. 517-519 Security Building, Phoenix, Arizona.

3. *Journal of Arkansas Education*. 503 Union Life Building, Little Rock, Arkansas.

4. *Colorado School Journal*. 230 Coronado Building, Denver, Colorado.

5. *Connecticut Teacher*. State Office Building, Hartford, Connecticut.

6. *Delaware School Journal*. Dover, Delaware.

7. *Journal of the Florida Education Association*. 6 Centennial Building, Tallahassee, Florida.

8. *Georgia Education Journal*. 704 Walton Building, Atlanta, Georgia.

9. *Idaho Journal of Education*. 331 Soma Building, Boise, Idaho.

10. *Illinois Education*. 100 East Edwards Street, Springfield, Illinois.

11. *Indiana Teacher*. Lincoln Hotel, Indianapolis, Indiana.

12. *Midland Schools*. 415 Shops Building, Des Moines, Iowa.

13. *Kansas Teacher*. 315 West Tenth Street, Topeka, Kansas.

14. *Kentucky School Journal*. 1421 Heyburn Building, Louisville, Kentucky.

15. *Louisiana Schools*. 418 Florida Street, Baton Rouge, Louisiana.

16. *Maine Teachers Digest*. 14 Western Avenue, Augusta, Maine.

17. *Massachusetts Teacher*. 14 Beacon Street, Boston, Massachusetts.

18. *Michigan Education Journal*. High School, Mount Clemens, Michigan.

19. *Minnesota Journal of Education*. 2429 University Avenue, St. Paul, Minnesota.

20. *Mississippi Educational Advance*. 219 North President Street, Jackson, Mississippi.
21. *Montana Education*. 403 Power Block, Helena, Montana.
22. *Nebraska Educational Journal*. 605 South Fourteenth Street, Lincoln, Nebraska.
23. *New Hampshire State Teachers Association Bulletin*. High School, Belmont, New Hampshire.
24. *New Jersey Educational Review*. 200 Stacy-Trent Hotel, Trenton, New Jersey.
25. *New Mexico School Review*. 114 East Marcy Street, Santa Fe, New Mexico.
26. *New York State Education*. 152 Washington Avenue, Albany, New York.
27. *North Carolina Education*. 113 West Morgan Street, Raleigh, North Carolina.
28. *North Dakota Teacher*. Bismarck, North Dakota.
29. *Ohio Schools*. 213 East Broad Street, Columbus, Ohio.
30. *Oklahoma Teacher*. 306 Key Building, Oklahoma City, Oklahoma.
31. *Oregon Education Journal*. Hillsboro, Oregon.
32. *Pennsylvania School Journal*. 400 North Third Street, Harrisburg, Pennsylvania.
33. *School and Community*. Raytown, Missouri.
34. *Sierra Educational News*. 660 Market Street, San Francisco, California.
35. *South Carolina Education News*. Fairforest, South Carolina.
36. *South Dakota Education Association Journal*. Belle Fourche, South Dakota.
37. *Tennessee Teacher*. Paris, Tennessee.
38. *Texas Outlook*. 410 East Weatherford Street, Fort Worth, Texas.
39. *Utah Educational Review*. 316 Beneficial Life Building, Salt Lake City, Utah.
40. *Vermont School Journal*. Lyndon Center, Vermont.
41. *Virginia Journal of Education*. 401 North Ninth Street, Richmond, Virginia.
42. *Washington Education Journal*. 707 Lowman Building, Seattle, Washington.
43. *West Virginia School Journal*. 2012 Quarrier Street, Charleston, West Virginia.
44. *Wisconsin Journal of Education*. 404 Insurance Building, Madison, Wisconsin.
45. *Wyoming Education News*. Newcastle, Wyoming.

F. United States Office of Education Publications

This is a selected series of publications of the Office of Education. For a comprehensive listing with explanatory annotations, see Carter, Alexander, *How to Locate Educational Information and Data*. New York: Bureau of Publications, Teachers College, Columbia University, 1941, Chap. XIV.

1. Annual Reports, 1867 to date.

2. Bulletins. (The bulletin series has covered practically every educational topic at one time or another. They have been indexed in the *Readers' Guide to Periodical Literature* from 1906 to date and in the *Education Index* since 1928.)

(1) Issued regularly:

(a) *Bibliography of Research Studies in Education* (usually bulletin number five of each year).

(b) *Educational Directory* (usually bulletin number one of each year).

(c) *Biennial Survey of Education* (usually bulletin number two of odd years).

(2) Issued occasionally:

(a) *Higher Education*.

(b) *Scholarships and Fellowships Available at Institutions of Higher Education*.

(c) *Junior Colleges*.

(d) *Review of Educational Legislation*.

(e) *Accredited Higher Institutions*.

(f) *Accredited Secondary Schools in the United States*.

(g) *Educational Boards and Foundations*.

3. Circulars, 1930 to date.

4. City School Leaflets, 1922-1929.

5. Commercial Education Leaflets, 1922-1924.

6. Community Center Circulars, 1918-1920.

7. *Doctors' Theses in Education*, 1935 to date.

8. *Education of Teachers*, Selected Bibliography, October 1, 1935 to January 1, 1941.

9. Foreign Education Leaflets, 1925-1927.

10. Future Publications of the Office.

11. Good References, 1931 to date.

12. Guidance Leaflets, 1931 to date.

13. Health Education Series, 1918-1927.

14. Higher Education Circulars, 1916-1928.

15. Home Economics Circulars, 1917-1924.

16. Industrial Education Circulars, 1919-1929.

17. Kindergarten Circulars, 1917-1925.

18. Leaflets, 1930 to date.
19. Library Leaflets, 1919-1929.
20. Pamphlets, 1930 to date.
21. Physical Education Series, 1923-1929.
22. Reading Courses, 1919-1932.
23. Record of Current Educational Publications of the United States Office of Education, January 1912-March 1932.
24. Price List Number Thirty-one (issued by the Superintendent of Documents listing all United States government publications in the field of education, revised annually).
25. *Recent Theses in Education*, 1931 to date.
26. Rural School Leaflets, 1922-1930.
27. School Health Studies, 1923-1929.
28. School Home Garden Circulars, 1915-1917.
29. School Life (official organ of the Office of Education).
Has lists of masters' and doctors' studies, sent to the Office of Education Library, which are available on loan, 1900 to date.
30. Secondary School Circulars, 1918-1921.
31. Statistical Circulars, 1923-1929.
32. Teachers' Leaflets, 1917-1924.

G. State Department of Education Publications

(A sample list)

These consist of bulletins, largely administrative in nature, annual reports, and occasional and series of research bulletins. More than twenty states and territories have definitely organized departments of research. For a discussion of the general functions of state departments of education, see W. D. Cocking and C. H. Gilmore, *Organization and Administration of Public Education*, Advisory Committee on Education, United States Government Printing Office, 1938. See also the latest issue of the Educational Press Association, *Classified List of Educational Periodicals*, National Education Association, Washington, D. C.; F. L. Whitney and E. U. Rugg, "Sources of Current Literature in Education," *Teachers Journal and Abstract*, 1: 47-53, 1926.

1. *Bulletin of the California State Department of Education*.
2. *Bulletin of the Department of Education* (Massachusetts).
3. *Bulletin of the State Department of Education* (Washington).
4. *Bulletin, State Board of Education* (Virginia).
5. *Bulletin to the Schools* (New York).
6. *California Journal of Elementary Education*.
7. *California Journal of Secondary Education*.

8. *California Schools*.
9. *Educational Bulletin* (Kentucky).
10. *Educational Press Bulletin* (Illinois).
11. *Florida School Bulletin*.
12. *Hawaii Educational Review*.
13. *Journal of the Department of Education, Puerto Rico*.
14. *Maine State School Bulletin*.
15. *Maryland School Bulletin*.
16. *Missouri Schools*.
17. *Nebraska Education Bulletin*.
18. *Nevada Educational Bulletin*.
19. *North Carolina Public School Bulletin*.
20. *Public Instruction* (Pennsylvania).
21. *State School Facts* (North Carolina).
22. *Tennessee Educational Bulletin*.
23. *The Department News* (South Dakota).
24. *Vocational Education News* (Ohio).
25. *West Virginia Educational Bulletin*.

H. Municipal School System Publications

(A sample list)

A part of these are published by local teachers' organizations and others by the school administration. Thirty-nine city school districts were reported in 1927 as having departments of research. See M. E. Townsend, "The Function and Organization of Educational Research Bureaus," *The American School Board Journal*, 75: 37-40, 136-139, 1927. The United States Office of Education, *Educational Directory*, Part II, *City School Officers*, Bulletin No. 1, lists all research directors in city school systems annually. See Edith A. Wright, *Organization and Function of Research Bureaus in City School Systems*. Office of Education Leaflet. Washington, D. C.: United States Office of Education, 1931, No. 2, 1931. See also *Review of Educational Research*, Chapter XIX, "Organized Research in Education," 9: 581-584, 1939; H. B. Chapman, *Organized Research in Education with Special Reference to the Bureau of Educational Research*, Bureau of Educational Research Monographs. Columbus, Ohio: Ohio State University Press, 1927, No. 7; W. H. Ziegel, *Research in Secondary Schools*. National Survey of Secondary Education Monograph. Washington, D. C.: Office of Education, 1933, No. 15 and other titles.

1. *Administrative Research Series* (Pasadena).
2. *Baltimore Bulletin of Education*.
3. *Boston Teachers News Letter*.

4. *Bulletin of High Points in the Work of the High Schools of New York City.*
5. *Chicago Schools Journal.*
6. *Curriculum Study and Educational Research Bulletin* (Pittsburgh).
7. *Denver Public Schools Bulletin.*
8. *Detroit Educational Bulletin.*
9. *Educational Research Bulletin* (Los Angeles).
10. *Educational Research Bulletin* (Pasadena).
11. *El Paso Schools Standard.*
12. *League Script* (Minneapolis).
13. *Los Angeles School Journal.*
14. *Newark School Bulletin.*
15. *Our City Schools* (Indianapolis).
16. *Pasadena Bulletin of Research, Personnel, and Service.*
17. *Pittsburgh School Bulletin.*
18. *Professional Pamphlet Series* (Milwaukee).
19. *Providence Public School Bulletin.*
20. *Public School Messenger* (St. Louis).
21. *Public School Program* (Rochester, New York).
22. *School and Community* (Spokane).
23. *School Bulletin* (Portland, Oregon).
24. *School Bulletin* (St. Paul).
25. *School Index* (Cincinnati).
26. *School Magazine* (Buffalo).
27. *School Review* (Denver).
28. *School Topics* (Cleveland).
29. *Seattle Educational Bulletin.*
30. *Superintendent's Bulletins* (Oakland).
31. *Teachers' Bulletin* (Highland Park, Michigan).

I. Publications of Teacher-Education Institutions

(A sample list)

1. *American School Master.* State Normal College, Ypsilanti, Michigan.
2. *Bulletins.* Indiana University, Bloomington, Indiana.
3. *Bulletins.* University of Kentucky, Lexington, Kentucky.
4. *Bulletins.* University of Michigan, Ann Arbor, Michigan.
5. *Bulletins.* University of Minnesota, Minneapolis, Minnesota.
6. *Bulletins.* University of North Dakota, Grand Forks, North Dakota.
7. *Bulletins, Monographs, Inglis Lectures.* Harvard University, Cambridge, Massachusetts.

8. Bulletins, *Journal of Higher Education, Educational Research Bulletin*. Ohio State University, Columbus, Ohio.
9. Bulletins. University of Wisconsin, Bureau of Educational Research, Madison, Wisconsin.
10. Bulletin of the School of Education. Bureau of Cooperative Research, Indiana University, Bloomington, Indiana.
11. College of Education Series. State University of Iowa, Iowa City, Iowa.
12. Colorado Teachers College Education Series. Colorado State College of Education, Greeley, Colorado.
13. Contributions to Education. Northwestern University, Evanston, Illinois.
14. Contributions to Education. Teachers College, Columbia University, New York.
15. Curriculum Laboratory Bulletin. Western Reserve University, Cleveland, Ohio.
16. Education Series. University of New Mexico, Albuquerque, New Mexico.
17. Education Service Series. Stephens College, Columbia, Missouri.
18. Educational Monographs. University of Nebraska, Lincoln, Nebraska.
19. Educational Monographs. University of Southern California, Los Angeles, California.
20. *Educational Outlook*. School of Education, University of Pennsylvania, Philadelphia, Pennsylvania.
21. *Educational Reference Circular, Studies in Higher Education*. Purdue University, Lafayette, Indiana.
22. Educational Research Monographs. Catholic University of America, Washington, D. C.
23. *Educational Research Record*. Extension Division, University of Nebraska, Lincoln, Nebraska.
24. Iowa Child Welfare Research Station Bulletins. State University of Iowa, Iowa City, Iowa.
25. *Journal of Higher Education*. Bureau of Educational Research, Ohio State University, Columbus, Ohio.
26. Laboratory Schools Publications. University of Chicago, Chicago, Illinois.
27. *Peabody Journal of Education*. George Peabody College for Teachers, Nashville, Tennessee.
28. Monographs. University of Minnesota, Minneapolis, Minnesota.
29. *Penn State Educator, Studies in Education*. Pennsylvania State College, State College, Pennsylvania.
30. Publications in Education. University of California, Bureau of Research in Education, Berkeley, California.

31. Publications in Education, Philosophy, and Psychology. University of California at Los Angeles, Los Angeles, California.
32. Publications in Social Sciences. University of Washington, Seattle, Washington.
33. Psychological Monographs and Journals. Clark University, Worcester, Massachusetts.
34. Research Bulletins and Circulars. University of Illinois, Urbana, Illinois.
35. Research Bulletins. Colorado State College of Education, Greeley, Colorado.
36. *Rock County Educational Bulletin*. Rock County Rural Normal Schools, Janesville, Wisconsin.
37. G. D. Strayer and N. L. Engelhardt, School Administration Series. Teachers College, Columbia University, New York.
38. School Economy Series. Stanford University, California.
39. *School of Education Bulletin*. University of Michigan, Ann Arbor, Michigan.
40. *School of Education Record*. University of North Dakota, Grand Forks, North Dakota.
41. *School of Education Record*. University of Washington, Seattle, Washington.
42. *School Progress*. State Teachers College, Mankato, Minnesota.
43. *Secondary Education in Virginia*. University of Virginia, Charlottesville, Virginia.
44. *Spokesman*. University of California, Berkeley, California.
45. Paul Monroe, Studies of the International Institute of Teachers College, Columbia University. Bureau of Publications, Teachers College, Columbia University, New York.
46. Studies in College Teaching. University of Oregon, Eugene, Oregon.
47. Studies in Education. Johns Hopkins University, Baltimore, Maryland.
48. Studies in Education. Pennsylvania State College, State College, Pennsylvania.
49. Studies in Education. Rutgers University, New Brunswick, New Jersey.
50. Studies in Education. University of Kansas, Lawrence, Kansas.
51. Studies in Education. Kansas State Teachers College, Emporia, Kansas.
52. Studies in Higher Education. Purdue University, Lafayette, Indiana.
53. Studies in Religious Education. Yale University, New Haven, Connecticut.
54. Supplementary Educational Monographs. University of Chicago, Chicago, Illinois.

55. *Teachers College Journal*. Indiana State Teachers College, Terre Haute, Indiana.
56. *Teachers College Record*. Columbia University, New York.
57. *Teachers Journal and Abstract*. Colorado State College of Education, Greeley, Colorado (to 1932).
58. *University of Illinois Bulletin*. Bureau of Educational Research, College of Education, University of Illinois, Urbana, Illinois.
59. *University of Pittsburgh School of Education Journal*. University of Pittsburgh, Pittsburgh, Pennsylvania.
60. *Virginia Teacher*. State Teachers College, Harrisonburg, Virginia.
61. *Vocational Guidance Magazine*. Bureau of Vocational Guidance, Harvard University, Cambridge, Massachusetts.

J. Representative Research Foundations

See W. S. Monroe, *et al.*, *Ten Years of Educational Research, 1918-1927*. Bureau of Educational Research. Urbana, Ill.: University of Illinois, 1928, Bulletin No. 42; J. D. Wolcott, *A Handbook of Educational Associations and Foundations in the United States*. Washington, D. C.: Bureau of Education, 1926, Bulletin 1926, No. 16; and United States Office of Education, *Educational Directory*, Part IV, *Educational Associations and Directories*, Bulletin No. 1, *Educational Foundations and Boards*; for the current year.

1. American Field Service Fellowships for French Universities. E. J. Fisher, Executive Secretary, 2 West Forty-fifth Street, New York.
2. American Foundation for Mental Hygiene. C. W. Beers, 50 West Fiftieth Street, New York.
3. American Foundation for the Blind. M. C. Migel, 654 Madison Avenue, New York.
4. American-Scandinavian Foundation. H. G. Leach, 116 East Sixty-fourth Street, New York.
5. Atwater Kent Foundation. A. A. Kent, 4700 Wissahickon Avenue, Philadelphia, Pennsylvania.
6. Barnes Foundation. A. C. Barnes, Merion, Pennsylvania.
7. Baron de Hirsch Fund. R. F. Colin, 165 Broadway, New York.
8. Belgian American Educational Foundation. P. C. Galpin, 420 Lexington Avenue, New York.
9. Bernarr Macfadden Foundation, Inc. Bernarr Macfadden, Bartholomew Building, 205 East Forty-second Street, New York.
10. Bureau of Educational Experiments, Cooperative School for Teachers. Mrs. L. S. Mitchell, 69 Bank Street, New York.
11. Carnegie Corporation of New York. R. M. Lester, 522 Fifth Avenue, New York.

12. Carnegie Foundation for the Advancement of Teaching. H. J. Savage, 522 Fifth Avenue, New York.
13. Child Education Foundation. Anna Eva McLin, 535 East Eighty-fourth Street, New York.
14. China Institute in America. Chih Meng, 125 East Sixty-first Street, New York.
15. Commonwealth Fund. B. C. Smith, 41 East Fifty-seventh Street, New York.
16. Duke Endowment. A. H. Sands, Jr., 30 Rockefeller Plaza, New York.
17. Educational Records Bureau. C. M. McConn, New York University, New York.
18. Edwin Gould Foundation for Children. C. D. Shrady, 422-424 West Fifty-eighth Street, New York.
19. Elizabeth McCormick Memorial Fund. Mary E. Murphy, 848 North Dearborn Street, Chicago, Illinois.
20. General Education Board. R. B. Fosdick, 49 West Forty-ninth Street, New York.
21. Harmon Foundation, Inc. Mary B. Brady, 140 Nassau Street, New York.
22. Henry C. Frick Educational Commission. George W. Gerwig, 487 Union Trust Building, Pittsburgh, Pennsylvania.
23. Institute of International Education, Inc. Stephan Duggan, 2 West Forty-fifth Street, New York.
24. International Association of Universities. Nicholas P. Raventos, Amargura 66, Habana, Cuba.
25. John Simon Guggenheim Memorial Foundation. Mrs. Simon Guggenheim, 551 Fifth Avenue, New York.
26. Josiah Macy Junior Foundation. E. S. S. Sunderland, 565 Park Avenue, New York.
27. Judge Baker Guidance Center. R. M. Cushman, 80 Federal Street, Boston, Massachusetts.
28. Juilliard Musical Foundation. G. W. Davison, 31 Nassau Street, New York.
29. Julius Rosenwald Fund. E. R. Embree, 4901 Ellis Avenue, Chicago, Illinois.
30. Kosciuszko Foundation. S. P. Mizwa, 157 East Sixty-fourth Street, New York.
31. Leopold Schepp Foundation. R. H. Williams, 551 Fifth Avenue, New York.
32. Milbank Memorial Fund. A. G. Milbank, 40 Wall Street, New York.
33. National Bureau for the Advancement of Music, Inc. C. M. Tremaine, 45 West Forty-fifth Street, New York.

34. Pan American Society of the United States, Inc. F. E. Hasler, 630 Fifth Avenue, New York.
35. Payne Fund. Mrs. C. C. Bolton, 1 Madison Avenue, New York.
36. Phelps-Stokes Fund. T. J. Jones, 101 Park Avenue, New York.
37. Phi Beta Kappa Foundation. J. K. Clark, 72 Wall Street, New York.
38. Preusser Foundation. J. F. Cooke, 171 Sansom Street, Philadelphia, Pennsylvania.
39. Rockefeller Foundation. R. B. Fosdick, 49 West Forty-ninth Street, New York.
40. Russell Sage Foundation. S. M. Harrison, 130 East Twenty-third Street, New York.
41. Russian Student Fund, Inc. Stephan Duggan, 2 West Forty-fifth Street, New York.
42. Southern Educational Foundation. A. D. Wright, 726 Jackson Place NW, Washington, D. C.
43. W. K. Kellogg Foundation. E. W. Morris, 258 Champion Street, Battle Creek, Michigan.
44. Workers Educational Bureau of America. T. E. Burke, Machinists Building, Washington, D. C.

K. Educational Bibliographies

(A sample list)

1. Carter Alexander, *Educational Research: Suggestions and Sources of Data with Specific Reference to Administration*. New York: Bureau of Publications, Teachers College, Columbia University (revised periodically).
2. G. L. Betts, et al., *Selected Bibliography on the Education of Teachers*. National Survey of the Education of Teachers. Washington, D. C.: United States Office of Education, 1932, Vol. I.
3. E. G. Blackstone, *Research Studies in Commercial Education*. Monographs in Education. Iowa City: University of Iowa, 1935.
4. L. E. Blanch, "Curriculum Surveys in Higher Education," *Journal of Higher Education*, 4: 255-260, 1933.
5. Dorothy Charles, *The Bibliographic Index: A Cumulative Bibliography of Bibliographies*. New York: H. W. Wilson Company, 1941.
6. A. O. Dech, "A Guide to the Literature of the Curriculum," *Teachers College Record*, 35: 407-414, 1934.
7. W. C. Eells, *Bibliography on Junior Colleges*, *Bulletin* 1930. Washington, D. C.: United States Office of Education, 1930, No. 2; also monthly supplements in the *Junior College Journal*.
8. C. V. Good, "Selected Bibliography on the Methodology of Educational Research and Related Problems," *Journal of Educational Research*, (September or October, annually).

9. C. V. Good, "Research Method Bibliography," *Phi Delta Kappan*, 30: 19-26, 148, 1948.

10. Ruth A. Gray, *Bibliography of Research Studies in Education, 1937-1938*. Washington, D. C.: United States Office of Education, 1939, Bulletin 1939, No. 5.

11. W. S. Gray, *Summary of Investigations Relating to Reading*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1925, No. 28; also annual supplements in the *Elementary School Journal* and *Journal of Educational Research*.

12. R. L. Lyman, *Summary of Investigations Relating to Grammar, Language, and Composition*. Supplementary Educational Monographs. Chicago: University of Chicago Press, 1929, No. 36.

13. W. S. Monroe, editor, *Encyclopedia of Educational Research*. New York: The Macmillan Company, 1941.

14. W. S. Monroe, *Titles of Masters' and Doctors' Theses in Education Accepted by Colleges and Universities in the United States*. Urbana, Ill.: College of Education, University of Illinois, 1917-1927, Vols. I-IV.

15. W. S. Monroe and Ollie Asher, *A Bibliography of Bibliographies*. Bureau of Educational Research. Urbana, Ill.: University of Illinois, 1927, Bulletin No. 36.

16. W. S. Monroe and M. D. Engelhart, *A Critical Summary of Research Relating to the Teaching of Arithmetic*. University of Illinois Bulletin. Urbana, Ill.: University of Illinois, 1931, No. 5.

17. W. S. Monroe, T. T. Hamilton, and V. T. Smith, *Locating Educational Information in Published Sources*, Chapter V, "Bibliography of Bibliographies," Bureau of Educational Research. Urbana, Ill.: University of Illinois, 1930, Bulletin No. 50.

18. W. S. Monroe, *et al.*, *Ten Years of Educational Research, 1918-1927*. Bureau of Educational Research. Urbana, Ill.: University of Illinois, 1928, Bulletin No. 42.

19. W. S. Monroe and Louis Shores, *A Catalogue of Bibliographies and Summaries in Education to June 30, 1935*. New York: H. W. Wilson Company, 1936. (This is continued in the *Education Index*.)

20. Research Committee on Social Trends, *Recent Social Trends in the United States: Report of the President's Research Committee on Social Trends*. New York: McGraw-Hill Book Company, 1933.

21. E. U. Rugg, *Summary of Investigations Relating to Extra-curricular Activities*. Colorado Teachers College Education Series. Greeley, Colo.: Colorado State College of Education, 1930, No. 9.

22. H. L. Smith and F. R. Noffsinger, *Bibliography of School Buildings, Grounds, and Equipment*, Parts II, IV, School of Education Bulletins, No. 3, 1933, and 2, 1935. Bloomington, Ind.: Indiana University, 1935.

L. Published Courses of Study

A good list of courses of study is given each month in the *Education Index*. New York: H. W. Wilson Company. Frequent reports issue from the United States Office of Education. See Edith A. Wright, *List of Courses of Study for Elementary and Secondary Schools, 1930-1935*, United States Office of Education Circular. Washington, D. C.: United States Office of Education, 1935, No. 139. The Society for Curriculum Study at Teachers College, Columbia University, has a comprehensive, continuing project for the collection and rating of courses of study. See H. B. Bruner, "Selected List of Courses of Study Published 1932-1933," *Society for Curriculum Study News Bulletin*, 4: 2-7, Number 27, 1933; H. B. Bruner and Mabel V. Cassell, "Annual List of Outstanding Courses of Study," *Curriculum Journal*, 6: 1-9, 1935; Florence B. Stratemeyer and H. B. Bruner, *Rating Elementary School Courses of Study*. New York: Bureau of Publications, Teachers College, Columbia University, 1926; H. B. Bruner, "Criteria for Evaluating Course-of-Study Materials," *Teachers College Record*, 39: 107 ff, 1937.

M. Survey Reports

Many state, city, and county survey studies are available. J. B. Sears is the pioneer student in this field. See J. B. Sears, *The School Survey*. Boston: Houghton Mifflin Company, 1925. A plan for the continuous check of important institutional data has been described. See F. L. Whitney, "An Administration Trend Book," *Journal of Higher Education*, 12: 271-273, 1941. Higher education surveys were covered by W. C. Eells, *Surveys of American Higher Education*. New York: Carnegie Foundation for the Advancement of Teaching, 1937.

APPENDIX IV

Representative Federal Surveys of Education

1. A. J. Klein, *et al.*, *Survey of Land-Grant Colleges and Universities*. Washington, D. C.: United States Office of Education, 1930, Vols. I and II.
2. E. S. Evenden, *et al.*, *National Survey of the Education of Teachers*. Washington, D. C.: United States Office of Education, 1932-1935, Vols. I-VI.
 - a. G. L. Betts, B. W. Frazier, and G. C. Gamble, *Selected Bibliography of the Education of Teachers*, Vol. I, 1932; b. E. S. Evenden, G. C. Gamble, and H. G. Blue, *Teacher Personnel in the United States*, Vol. II, 1932; c. E. U. Rugg, W. E. Peik, F. K. Foster, W. C. John, and R. B. Raup, *Teacher Education Curricula*, Vol. III, 1935; d. Ambrose Caliver, *Education of Negro Teachers*, Vol. IV, 1933; e. B. W. Frazier, G. L. Betts, W. J. Greenleaf, Douglas Waples, N. H. Dearborn, Mabel Carney, and Thomas Alexander, *Special Survey Studies*, Vol. V, 1935; f. E. S. Evenden, *Summary and Interpretation*, Vol. VI, 1935.
3. P. R. Mort, *et al.*, *National Survey of School Finance*. Washington, D. C.: United States Office of Education and American Council on Education, 1933.
 - a. P. R. Mort, *et al.*, *State Support for Public Education*. Washington, D. C.: American Council on Education, 1933; b. Research Staff, *et al.*, *Research Problems in School Finance*. Washington, D. C.: American Council on Education, 1933; c. Carter Alexander and Timon Covert, *Bibliography on Educational Finance, 1923-1931*. Washington, D. C.: United States Office of Education, 1932, Bulletin No. 15.
4. L. V. Koos, *et al.*, *National Survey of Secondary Education*, Twenty-nine Monographs. Washington, D. C.: United States Office of Education, 1934.
 - a. L. V. Koos, *et al.*, *Summary*, Monograph No. 1, 1934; b. G. N. Kefauver, V. H. Noll, and C. E. Drake, *The Horizontal Organization of Secondary Education*, Monograph No. 2, 1934; c. G. N. Kefauver, V. H. Noll, and C. E. Drake, *Part-Time Secondary Schools*, Monograph No. 3, 1933; d. G. N. Kefauver, V. H. Noll, and C. E. Drake, *The Secondary School Population*, Monograph No. 4, 1933; e. F. T. Spaulding, O. I. Frederick, and L. V. Koos, *The Reorganization of Secondary Education*, Monograph No. 5,

1933; f. E. N. Ferriss, W. H. Gaumnitz, and P. R. Brammell, *The Smaller Secondary Schools*, Monograph No. 6, 1933; g. Ambrose Caliver, *Secondary Education for Negroes*, Monograph No. 7, 1933; h. Fred Engelhardt, W. H. Zeigel, Jr., W. M. Proctor, and S. S. Mayo, *District Organization and Secondary Education*, Monograph No. 8, 1933; i. W. W. Keesbeker and F. C. Sewell, *Legal and Regulatory Provisions Affecting Secondary Education*, Monograph No. 9, 1933; j. P. R. Brammell, *Articulation of High School and College*, Monograph No. 10, 1933; k. Fred Engelhardt, W. H. Zeigel, Jr., and R. O. Billett, *Administration and Supervision*, Monograph No. 11, 1933; l. W. S. Deffenbaugh and W. H. Zeigel, Jr., *Selection and Appointment of Teachers*, Monograph No. 12, 1933; m. R. O. Billett, *Provisions for Individual Differences, Marking, and Promotion*, Monograph No. 13, 1933; n. W. C. Reavis, *Programs of Guidance*, Monograph No. 14, 1933; o. W. H. Zeigel, Jr., *Research in Secondary Schools*, Monograph No. 15, 1933; p. Belmont Farley, *Interpreting the Secondary School to the Public*, Monograph No. 16, 1933; q. B. L. Johnson, *The Secondary-School Library*, Monograph No. 17, 1933; r. E. S. Lide, *Procedures in Curriculum Making*, Monograph No. 18, 1933; s. A. K. Loomis, E. S. Lide, and Lamar Johnson, *The Program of Studies*, Monograph No. 19, 1933; Dora V. Smith, *Instruction in English*, Monograph No. 20, 1933; u. W. G. Kimmel, *Instruction in the Social Studies*, Monograph No. 21, 1933; v. W. L. Beauchamp, *Instruction in Science*, Monograph No. 22, 1933; w. E. S. Lide, *Instruction in Mathematics*, Monograph No. 23, 1933; x. Helen M. Eddy, *Instruction in Foreign Languages*, Monograph No. 24, 1933; y. Anne E. Pierce and R. W. Hilpert, *Instruction in Music and Art*, Monograph No. 25, 1933; z. W. C. Reavis and G. E. Van Dyke, *Nonathletic Extra-Curriculum Activities*, Monograph No. 26, 1933; aa. P. R. Brammell, *Intramural and Interscholastic Athletics*, Monograph No. 27, 1933; bb. P. R. Brammell, *Health Work and Physical Education*, Monograph No. 28, 1933; cc. C. A. Jessen, *Needed Research in Secondary Education*, Bulletin No. 28, 1937, United States Office of Education, 1937.

5. President's Commission on Higher Education, *Higher Education in America*.

Volume 1, Establishing the Goals; 2, Equalizing and Expanding Individual Opportunity; 3, Organizing Higher Education; 4, Staffing Higher Education; 5, Financing Higher Education; 6, Resource Data. Washington, D. C.: Government Printing Office, 1947.

APPENDIX V

Agenda for Eight Types of Research Studies

1. Descriptive Research

A Survey of Educational Finance Inequalities in Weld County, Colorado
J. F. Moreland

Objectives

Proximate

1. To determine the financial status of all school districts in Weld County, Colorado
2. To score all the schools in Weld County in regard to site, buildings, equipment, teachers, and curriculum
3. To determine each district's ability to support its schools

Ultimate

1. To devise a method of equalizing educational opportunities in Weld County in terms of fiscal support

PROCEDURES

I. Reading

TECHNIQUES

I. Bibliography

1. BALDWIN, R. D., *Financing Rural Education*. Stevens Point, Wis.: Rural Service Press, 1927. There is a good analysis of "special aids" used by various states to help equalize equalities of education. Three plans are given for equalization which are applicable to the present survey.
2. BAGLEY, W. C., "How Shall Opportunity be Equalized?" *National Education Association Journal*, 13: 315-316, 1924. Dr. Bagley points out the gross educational inequali-

PROCEDURES

TECHNIQS

ties between states upon the basis of the nation as a unit.

3. CUBBERLEY, E. P., *School Funds and Their Apportionment*. New York: Teachers College, Columbia University, 1905. This doctor's dissertation is a masterly study of public school finance, with particular reference to the proper distribution of the revenues at hand. Dr. Cubberley has made a detailed examination of the various bases of apportionment and has established certain principles that should control in the arranging or rearranging of any state apportionment plan.
4. The Educational Finance Inquiry Commission, American Council on Education, *The Fiscal Administration of City-School Systems*. New York: The Macmillan Company, 1924. This book accurately describes significant differences in fiscal practices in city school systems, classifying these systems on the basis of relative independence from general municipal authorities.
5. FRASIER, G. W., *The Control of City School Finances*. Milwaukee: The Bruce Publishing Co., 1922. This doctor's dissertation is a scholarly discussion of the merits of the different methods of controlling funds for the public schools and an argument for fiscal independence for the board of education.
6. SWIFT, F. H., *Studies in Public School Finance*. Minneapolis: University of Minnesota, 1922. This is a careful analysis of the financial systems of California and Colorado, pointing out inequalities due to finance.

PROCEDURES

- II. Survey the financial status of all 136 school districts in Weld County, Colorado.

- III. Score each school in Weld County, Colorado.

- IV. Classify the data.

TECHNIQS

- II. Factors checked
1. Property valuations (real)
 2. Assessed valuations
 3. School-tax rates
 - a. County
 - b. State
 - c. District
 4. Bonded indebtedness
 5. Total tax levy
 6. County, state, and national aid
 7. Amount of valuation per pupil enrolled
 8. Per pupil cost and per teacher cost based on average daily attendance and enrollment
 9. Income-tax returns
 10. Classes of property escaping taxation

- III. Score cards for measuring the schools were worked out by having the graduate seminar score the items.

1. The items of the index are:
 - a. Site, buildings, and equipment—200 points
 - b. Teacher—500 points
 - c. Curriculum—300 points
2. The site, buildings, and so on, are evaluated as follows:
 - a. Site—100
 - b. Buildings—300
 - c. Lighting—200
 - d. Equipment—200
3. A personal trip to each school will be the method of scoring each school on the above data.

- IV. This will follow accepted methods of tabulation and graphic representation such as are given in:

1. McCALL, W. A., *How to Measure in Education*. New York: The Macmillan Company, 1923.
2. WHITNEY, F. L., *Statistics for Beginners in Education*. New York: D. Appleton & Co., 1929.

PROCEDURES

TECHNICS

- | | |
|---|--|
| <p>V. Determine the financial achievement of each district in Weld County, Colorado.</p> <p>VI. Interpret the findings.</p> <p>VII. Write the report.</p> | <p>3. WILLIAMS, J. H., <i>Graphic Methods in Education</i>. Boston: Houghton Mifflin Co., 1924.</p> <p>V. This will be an analysis of what a district pays for its schools in terms of its ability to support the schools.</p> <ol style="list-style-type: none"> 1. Present cost of schools 2. District's ability to support the schools <ol style="list-style-type: none"> a. Amount of tax levy for school expenses b. Tax levy for other expenses in the community c. Assessed valuation per child enrolled in the school 3. Ratio between what a district can do and does do for its school children <p>VI. This will be in accordance with the true meaning of each unit of data and the light of problems discussed. Summaries will be presented of:</p> <ol style="list-style-type: none"> 1. Educational inequalities found 2. Success or failure in attempts to remedy conditions <p>Recommendations will be made for equalizing educational opportunities in Weld County, Colorado.</p> <p>VII. Tentative chapter heads and sub-headings</p> |
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PREFACE

CHAPTER I. INTRODUCTION

1. The Problem
 - a. Definite Statement of the Problem
 - b. Review of What Has Been Done in the Field
 - c. The Contribution of the Present Study
 - d. Availability of the Data
2. The Thesis

PROCEDURES

TECHNICS

3. Procedure and Technic
4. Brief Summary of Findings

CHAPTER II. THE FISCAL SURVEY

1. Property Valuations
2. Assessed Valuations
3. School Tax Rates
4. Bonded Indebtedness of All School Districts
5. Total Tax Levy for All School Districts
6. County, State, and National Aid
7. Amount of Valuation of Property per Pupil Enrolled
8. Per Capita Cost and per Teacher Cost Based on Attendance and Enrollment
9. Summary

CHAPTER III. THE SCORE CARD CHECK

1. Explanation of the Indexes Used
2. Relative Ranking of the School
3. Summary

CHAPTER IV. FINANCIAL ACHIEVEMENT OF EACH DISTRICT

1. Present Cost of the Schools
2. The District's Ability to Support the Schools
3. The Ratio between What a District Can Do and Does Do for Its School Children
4. Summary

CHAPTER V. SUMMARY AND CONCLUSIONS

1. A Brief Summary of Each Point Raised in the Statement of the Problem
2. An Evaluation of the Thesis
3. Important Conclusions
4. Recommendations for a Progressive Program
5. Further Research Needed

BIBLIOGRAPHY

APPENDICES

2. Historical Research

A History of Douglas County, Colorado

Mary Ditmars

Objectives

Proximate

1. To find facts relating to the history of Douglas County, Colorado
2. To organize the facts into a complete history of Douglas County, Colorado

Ultimate

1. To show that Douglas County, Colorado, as it exists to-day is the result of the work of its early settlers

PROCEDURES

- I. Reading on the historical method of research

- II. Preparation of a bibliography

A. Original sources

1. Administration of justice
2. County expenditures
3. Work of the county court
4. Organization of the county
5. The dividing of Douglas County
6. Education

TECHNIQS

- I. Bibliography

1. ABBOTT, W. C., "Macaulay and the New History," *Yale Review*, 18: 539-557, 1929. This article suggests ways to make history more interesting to the reader and discusses the desirability of making historical reports readable as well as accurate.
2. FLING, F. M., *The Writing of History*. New Haven: Yale University Press, 1920. This book discusses the evaluation of different types of source material and gives many helpful suggestions on writing a thesis.

- II. Sources investigated

A. Original sources

1. District court records
2. Douglas County commissioner's records, 1864 to date
3. Probate court records, 1871 to date
4. Colorado statutes, 1861
5. Colorado statutes
6. School records, to date
7. County clerks' records, 1863 to date
8. County assessors' records, to date

PROCEDURES

7. Industries incorporated, homesteads taken up, and so on
8. Land values and taxation
9. Local happenings
10. Church history
11. Local history prior to 1883
12. Miscellaneous data

B. Secondary sources

1. General information about Douglas County, Colorado
2. Douglas County pioneers and date of settlement
3. Pioneer newspapers, churches, and schools

III. Gathering data

1. From original sources
2. From secondary sources
3. Personal interviews for information about:
 - a. Schools
 - b. Indian attacks
 - c. Perry Park
 - d. Franktown
 - e. Castle Rock
 - f. West Plum Creek
 - g. Administration of justice
 - h. Homesteading in Douglas County
 - i. New Memphis
 - j. Indian attacks
 - k. Rockridge
 - l. Sedalia

TECHNICS

9. *Douglas County Record Journal* files, to date
10. Church records of: Methodist churches at Castle Rock and Parker, Episcopal churches at Castle Rock and West Plum Creek, Catholic church at Castle Rock
11. "Memoirs of James Frank Gardner"
12. *Colorado Yearbook, 1927*. Denver, Colo.: State Board of Emigration, 1927.

B. Secondary sources

1. BAKER, James H., *et al.*, *History of Colorado*, Vols. I and II. The State Historical and Natural History Society of Colorado. Denver, Colo.: Linderman & Co., 1927.
2. HALL, Frank, *History of Colorado*, Vol. II. Chicago: Blakeley Printing Co., 1890.
3. STONE, W. F., *History of Colorado*, Vol. I. Chicago: J. Clark Co., 1918.

III. Gathering data

1. Collect material from newspapers, court records, school records, and other written records
2. Collect material about Douglas County from the best secondary sources
3. Interview the following old settlers:
 - a. Mrs. Agnes Alford
 - b. Mrs. Charles Breuss
 - c. John Cantrill
 - d. John Cambell
 - e. William Chamberlain
 - f. Mrs. Allen Dakan
 - g. William Dillon
 - h. Mrs. Doepke
 - i. Mrs. Mary James
 - j. David McMurdo

PROCEDURES	TECHNICS
<i>m.</i> Rockridge	<i>k.</i> Mrs. Misner
<i>n.</i> West Plum Creek	<i>l.</i> Mr. Perry
<i>o.</i> Castle Rock	<i>m.</i> Mrs. William Schriver
	<i>n.</i> Mrs. U. T. Smith
	<i>o.</i> Hugh Taylor
IV. Organization and classification of data	IV. Items Organize material in chronological order from date of first settlement to date under each topic
V. The writing of the thesis	V. Probable chapters
	PREFACE
	INTRODUCTION
	1. Statement of the Problem
	2. Description of Sources and Methods Used to Secure the Data
	CHAPTER I. EARLY SETTLEMENT OF DOUGLAS COUNTY
	1. Location
	2. Population
	3. Social, Political, and Industrial Life
	CHAPTER II. ORGANIZATION OF DOUGLAS COUNTY
	1. Date
	2. Size and Population
	3. Public Officials
	4. Struggle Over the Location of the County Seat
	CHAPTER III. HOMESTEADERS VERSUS THE CATTLEMEN
	1. The Attitude of the Cattlemen Towards the Fencing of the Open Range
	2. How and Where the Struggle Started
	3. Acts of Violence Committed and Results of the Struggle
	CHAPTER IV. EDUCATION IN PIONEER DAYS
	1. Location and Number of Schools

PROCEDURES

TECHNICS

2. Qualifications of Teachers
3. Number of Pupils Enrolled

CHAPTER V. RELIGION

1. Location of First Churches
2. Pioneer Ministers and Their Work
3. Effect of the Churches in Their Local Communities

CHAPTER VI. RAILROAD BUILDING

1. The Denver Rio Grande Railroad
2. The Atchison, Topeka, and Santa Fe Railroad
3. Effect of the Railroad Building on the Development of Douglas County

CHAPTER VII. FURTHER DEVELOPMENT OF DOUGLAS COUNTY

1. Increase in Population
2. Industries:
 - Gold Mining
 - Stone Quarrying
 - Farming
 - Cattle Raising
 - Dairying
3. Education
4. Social Life
5. Construction of Roads and Public Buildings

CHAPTER VIII. DOUGLAS COUNTY SINCE 1900

1. Schools Established
2. New Industries
3. Population and Distribution
4. Improvement of Roads
5. Establishment of the Forest Reserve

CHAPTER IX. GENERAL SUMMARY

APPENDIX

Bibliography

3. Experimental Research

The Value of Field Trips in the Teaching of Secondary School Subjects

W. S. Curd

Objectives

Proximate

1. To secure two equivalent groups in general science in the Colorado State Teachers College High School
2. To teach one group by the traditional method and the other by means of field trips largely
3. To measure differences of achievement resulting
4. To reach general conclusions so far as possible

Ultimate

1. To determine the relative value of two methods of teaching general science.

PROCEDURES

- I. Reading of materials pertaining to investigation.

TECHNICS

- I. Bibliography
 1. BARKER, G. A., "Field Trip to Study Lava Flow," *Journal of Geography*, 6: 25, 1907.
 2. BRANOM, M. E., *The Teaching of Geography*. Boston: Ginn & Co., 1921.
 3. Course of Study, University Elementary School, "Volunteer Field Trips," *Elementary School Teacher*, 8: 490, 1908.
 4. DARRAH, D., "Field Work as a New Educational Principle," *Educational Review*, 55: 20, 1918.
 5. DRYER, C. R., "Field Work in Physical Geography," *Journal of Geography*, 10: 8, 1911.
 6. FREEMAN, F. N., *Visual Education*. Chicago: University of Chicago Press, 1924.
 7. GIEKIE, A., *Teaching of Geography*. Chicago: A. Flanagan, 1887.
 8. HALL, Jennie, "Geography Made Real by Field Study," *Journal of Geography*, 16: 301, 1918.
 9. ———, "Pupils' Views on Field

PROCEDURES

TECHNICS

- Trips in Geography," *Journal of Geography*, 11: 138, 1912.
10. HOLTZ, F. L., *Principles and Methods of Teaching Geography*. New York: The Macmillan Company, 1913.
 11. KELLEY, L. C., "A Few Suggestions on Field Trip Work," *Journal of Geography*, 14: 259, 1916.
 12. KLOBE, P. R., "Some Phases of Field Work," *Educational Review*, 51, 478, 1916.
 13. ———, "Does Field Work Deserve Collegiate Recognition?" *School and Society*, 3: 321, 1916.
 14. MEYERS, I. B., "Field Work and Nature Study," *Elementary School Teacher*, 8: 225, 1908.
 15. SMITH, E. E., *Teaching of Geography by Problems*. New York: Doubleday, Page & Co., 1921.
 16. TOWER, W. S., "The Question of Field Work in Geography," *Journal of Geography*, 12: 345, 1914.
 17. TWISS, G. R., *Science Teaching*. New York: The Macmillan Company, 1917.
- II. Selection and organization of the field of investigation
- II. 1. Permission of the principal and instructors of Colorado State Teachers College High School to use groups for investigation
2. Interview the instructors about material to be used for the study
 3. Classification of groups
 - a. Groups divided according to
 - (1) Test score (Terman group test)
 - (2) Mental age (Terman group test)
 - (3) IQ
 - (4) Instructors' rating (daily recitation and test scores)
 - (5) Ruch-Popenoc, General Science Test Score
 - b. Group No. 1 on field trip

PROCEDURES	TECHNICS
	c. Group No. 2, classroom study of same material presented to group No. 1
III. Making the study	III. Program of experiments <ol style="list-style-type: none"> 1. Humidity of the atmosphere, October 25 2. How plants store food, November 3 to 7 3. Structure and composition of air, November 17 to 21 4. Erosion, November 25 to 26 5. City water supply, future 6. City sanitation, future 7. Legislative government, future 8. Judicial government, future 9. Manufacturing, future
IV. Report of the investigation	IV. Chapter titles <p>PREFACE</p> <p>INTRODUCTION</p> <p>CHAPTER I</p> <ol style="list-style-type: none"> 1. Possibilities of Object Lessons and Field Trips 2. Object Lessons and Field Trips in the Study of Science 3. Summary <p>CHAPTER II</p> <ol style="list-style-type: none"> 1. Report and Interpretations of Investigations 2. Humidity of Atmosphere 3. Composition of Air—Atomic Theory 4. Machines and Work 5. How Plants Store Foods 6. Common Machines and Work 7. Plant Production of Foods <p>CHAPTER III</p> <ol style="list-style-type: none"> 1. Suggestive Field Trips in the Vicinity of Colorado State Teachers College <p>The Sugar Factory</p> <p>The Canning Factory</p>

PROCEDURES

TECHNICS

The Creamery
 The Bakery
 The Court House
 The City Hall
 The Candy Factory
 Any Public Buildings
 The Gas Plant
 The Ice Plant
 The Cheese Factory (La Salle)
 The Dairies
 The Round House (La Salle)
 The Green Houses
 The Garages
 The Irrigation Projects
 The Museums of Teachers College
 The Campus of Teachers College

CHAPTER IV

General Summary
 Recommendations

APPENDIX

Tests Used in Experiments
 Bibliography

4. Philosophical Research

Contributions to Education from the World's Great Utopias

H. N. Spencer

Objectives

Proximate

1. To discover the theories of the various Utopias and the importance these assign to education
2. To discover the curriculums suggested and determine the methods used in Utopian schools
3. To determine the extent to which the curriculum and methods of Utopian schools are found in modern education
4. To discover the theories advanced in Utopias that are applicable in the present educational situation
5. To offer a criticism of modern educational theory and practice in the light of Utopian theories

Ultimate

1. To make an analytical study of the educational aspects of the great Utopias

2. To write a report presenting this study and suggesting improvement in modern educational practice

PROCEDURES

- I. Reading of the great Utopias

- II. Summarize Utopian literature in general.

- III. Study of Utopian educational theories, curriculums, and methods

TECHNIQS

- I. Bibliography

1. AUGUSTINE, *The City of God*. Edinburgh: T. and T. Clark, 1871.
2. BACON, Sir Francis, *New Atlantis*. Cambridge, Mass.: Harvard University Press, 1919.
3. BELLAMY, Edward, *Looking Backward*. Boston: Houghton Mifflin & Co., 1898.
4. CAMPANELLA, Thomas, "The City of the Sun," *Ideal Commonwealths*. New York: P. F. Collier & Son, 1901.
5. HARRINGTON, James, "Oceana," *Ideal Commonwealths*. New York: P. F. Collier & Son, 1901.
6. MORE, Sir Thomas, *Utopia*. Oxford, Eng.: The Clarendon Press, 1904.
7. MORRIS, William, *News from Nowhere*. London and Bombay: Longmans, Green & Co., 1903.
8. PLATO, *The Republic*. Washington and London: M. Walter Dume, 1901.
9. WELLS, H. G., *New Worlds for Old*. New York: The Macmillan Company, 1919.

- II. Make a summary of the larger generalizations found in the Utopian accounts.

- III. This analysis is to be made through a critical study of the theories.
 1. Purpose of education
 2. Theories of education
 - a. General
 - b. Psychological
 - c. Sociological
 3. Who are to be educated
 - a. Classes
 - b. Sex

PROCEDURES

TECHNICS

- c.* Physical qualifications
- d.* Mental qualifications
- 4. Teachers
 - a.* Who are to be teachers
 - b.* Training
 - c.* Position in society
- 5. Educational institutions
 - a.* Early education
 - b.* Common education
 - c.* Higher education
- 6. Administration of institutions
 - a.* Private
 - b.* State
- 7. Curriculums
 - a.* Things to be omitted
 - b.* Subjects to be taught
- 8. Methods
 - a.* General
 - b.* Special

IV. Determine current pro- IV.
cedures.

1. A description of current educational procedures as practiced in
 - a.* Colorado State Teachers College and its practice schools
 - b.* The University of Colorado
 - c.* A liberal-arts college
2. A study of curriculums and methods advanced by Herbert Spencer as marking the start of modern education. Spencer, Herbert, *Education; Intellectual, Moral, and Physical*. New York: D. Appleton & Co., 1861.
3. The cardinal aims of education, KINGSLEY, C. D., *et al.*, *Report of the Committee on the Reorganization of Secondary Education*. Bulletin No. 35. Washington: United States Bureau of Education, 1918, pp. 11-15.
4. Analysis of the following books
 - a.* BOBBITT, J. F., *The Curriculum*. Boston: Houghton Mifflin Co., 1918.

PROCEDURES

TECHNICS

- | | |
|--|--|
| <p>V. Compare data.</p> <p>VI. Draw conclusions.</p> <p>VII. Writing of the thesis</p> | <p>b. DEWEY, JOHN, <i>The School and Society</i>. Chicago: The University of Chicago Press, 1916.</p> <p>c. KELLY, F. J., <i>The American Arts College</i>. New York: The Macmillan Company, 1923.</p> <p>d. KILPATRICK, W. H., <i>Source Book in the Philosophy of Education</i>. New York: The Macmillan Company, 1923.</p> <p>5. Analysis of institutional catalogs</p> <p style="padding-left: 20px;">a. A typical university</p> <p style="padding-left: 20px;">b. Colorado State Teachers College Training Schools</p> <p style="padding-left: 20px;">c. Colorado State Teachers College as a type of a modern technical school</p> <p>V. Contrast similarities and dissimilarities found (a) in the Utopian ideal and (b) in modern education, and criticize each in the light of the other.</p> <p>VI. In accordance with the true aim and purpose of both Utopian and modern educational practice</p> <p>VII. Tentative chapter heads</p> |
|--|--|

PREFACE

CHAPTER I. INTRODUCTION

1. Statement of Problem
2. Procedure Followed
3. Technic Employed
4. Brief Summary

CHAPTER II. UTOPIAN THEORIES

1. Common to All
2. Peculiar to Individual Utopias
3. Chronological Development
4. Summary

CHAPTER III. CURRICULUMS OF THE UTOPIAS

1. Common Education
2. Higher Education
3. Special
4. Summary

PROCEDURES

TECHNICS

CHAPTER IV. METHODS OF TEACHING IN
THE UTOPIAN SCHOOLS

1. Group Education
2. Individual Education
3. Summary

CHAPTER V. MODERN PROCEDURES

1. Aims of Present Day Education
2. Common School Education
3. Higher Education
4. Summary

CHAPTER VI. UTOPIAN THEORIES AND
MODERN EDUCATION

1. Utopian Theories in Current Procedures
2. Suggested Improvement in Current Theory and Practice
3. Summary

CHAPTER VII. GENERAL SUMMARY AND
CONCLUSIONS

1. Content of the Study
2. Conclusions and Recommendations
3. Further Research

BIBLIOGRAPHY

APPENDIX

5. Prognostic Research

Predicting College Marks

C. C. Leinbaum

Objectives

Ultimate

- a. To furnish a measuring instrument for predicting college grades
- b. To aid in the educational guidance of students of Colorado State Teachers College

Proximate

- a. To make a statistical study of marks made by students on the Thurstone Classification Test, Cross English Test, Colgate Personal Inventory Test, average high-school grade, and marks made in the sophomore year at college
- b. To make a statistical study of marks made by students on the Thur-

- stone Classification Test, Cross English Test, their average high-school grade, and marks made in the freshman year at college
- c. To show the relative influence of the other variables in (a) and (b) in the prediction of college marks

PROCEDURES

- I. A survey of the available literature of the field

METHODS

- I. Bibliography
1. BURKS, Barbara S., "On the Inadequacy of the Partial and Multiple Technic," *Journal of Educational Psychology*, 17: 532-540, 1926.
 2. BURT, C. L., *Mental and Scholastic Tests*. London: King & Son, Ltd., 1921.
 3. DITTMER, C. G., *Introduction to Social Statistics*. Chicago: Shaw & Co., 1926.
 4. FLEMING, C. W., *A Detailed Analysis of Achievement in the High School*. Contributions to Education, No. 196. New York: Teachers College, Columbia University, 1925.
 5. GARRETT, H. E., *Statistics in Psychology and Education*. New York: Longmans, Green & Co., 1926.
 6. KELLY, T. L., *Statistical Method*. New York: The Macmillan Company, 1923.
 7. MONROE, W. S., *An Introduction to the Theory of Educational Measurements*. Boston: Houghton Mifflin Co., 1923.
 8. ———, *Measuring the Results of Teaching*. Boston: Houghton Mifflin Co., 1918.
 9. ODELL, C. W., *Educational Statistics*. New York: The Century Co., 1925.
 10. RUGH, G. M., *The Improvement of the Written Examination*. Chicago: Scott, Foresman and Co., 1924.
 11. RUGG, H. O., *Statistical Methods*

PROCEDURES

METHODS

Applied to Education. Boston: Houghton Mifflin Co., 1917.

12. YULE, G. U., *An Introduction to the Theory of Statistics.* London: Charles Griffin & Co., Ltd., 1919.
13. WHITNEY, F. L., *The Prediction of Teaching Success.* Journal of Educational Research Monograph, No. 6. Bloomington, Ill.: Public School Publishing Co., 1924.

II. The Investigation

1. Secure data for predicting grades of college sophomores.

2. Secure data for predicting grades of college freshmen.

3. Classify the data.

II.

1. Scores of the same group on:
 - a. The Colgate Personal Inventory Test
 - b. The Thurstone Classification Test
 - c. The Cross English Test
 - d. Figure each individual's high-school mark
 - e. Figure each individual's average college mark for his sophomore year

2. Scores of the same group on:
 - a. The Thurstone Classification Test
 - b. The Cross English Test
 - c. Find each individual's average high-school grade
 - d. Find each individual's average college grade for his freshman year

3.
 - a. Make a frequency distribution of all scores of each list of scores used for predicting sophomore grades.
 - b. Make a frequency distribution of all scores of each list of scores used for predicting freshman marks.
 - c. Find the average for each set of marks used in (a) and (b) above by means of the Pearson product-moment method.

PROCEDURES

METHODS

III. Interpretation of Findings

1. Illustrate the results.

2. Discussion of results.

- d.* Find zero order correlations between lists of scores within the group used to predict sophomore grades.
- e.* Same procedure as (*d*) for the group of scores used in predicting freshman grades.
- f.* Compute the partial r 's.
- g.* Calculate the regression coefficients.
- h.* Write the regression equation.
- i.* Test the regression equation by predicting the scores used.
- j.* Find the probable error.

1.

- a.* Construct tables showing the distributions of each set of scores used in prediction.
- b.* Construct tables of averages of the variables used in prediction.
- c.* Construct tables showing the zero order correlations.
- d.* Construct tables showing the partial r 's.
- e.* Show the working out of the formula for the regression equation.
- f.* Substitute scores in the regression equation to show its use.
- g.* Show the probable error of estimate by the development of the formula and by its use.
- h.* By means of tables, show the predicted and actual scores for a number of individuals.

2.

- a.* In showing any table or formula interpret the use or meaning of the table or formula.
- b.* Interpret the results of the development of each regression equation step by step.

PROCEDURES

METHODS

- c. Interpret the result of the study.
 - (1) Its soundness from a statistical standpoint
 - (2) Its value as a factor in predicting college grades
 - (3) Its value in educational guidance

IV. Detailed Report

1. Arrangement of material.

IV.

1. Tentative chapter headings

CHAPTER I. INTRODUCTION

1. The Need of Such an Investigation
2. The Problem
3. The Thesis
4. Brief Summary of Findings

CHAPTER II. PREDICTING COLLEGE MARKS
IN THE SOPHOMORE YEAR

1. The Measures Used
2. Technic
3. Translation of College and High School Marks
4. Summary

CHAPTER III. PREDICTING COLLEGE MARKS
IN THE FRESHMAN YEAR

1. The Measures Used
2. Technic
3. Summary

CHAPTER IV. FINAL INTERPRETATION AND
CONCLUSIONS

1. General Summary
2. Recommendations
3. Further Research Needed

6. Sociological Research

An Analysis of Graduates and Vocational Opportunities

J. F. Essig

1. THE AIM

It is the purpose of this study to secure a fairly adequate picture of the Grand Junction, Colorado, public school graduates and to get an analysis of vocational opportunities in the community into which the student is projected

after he leaves the school. Such information as is gathered is to be used as a background, in part, for determining the school curriculum.

This is to be an analytical approach to the task of curriculum building. The factors to be analyzed are the factors in the community which directly affect the graduates of the school and the factors in the community which encourage pupils to select the vocations they select. It is intended that all facts obtained relative to vocational choices may be brought to bear upon the learning environment which the school attempts to create.

2. STATISTICAL PROCEDURES

Education can best be studied and directed in terms of the individual but can best be organized and administered in terms of the community and its needs. Such a point of view assumes great emphasis upon the importance of the community. It assumes that education is a task of creating local environment such that guided development is possible. It is a case of fitting pupil lives into the pattern of local communities so that both the pupil and the community will have a better common understanding. Both pupils and the community should mutually benefit from the common relationship.

America is predominantly a land of small communities. As such the schools in many instances have not trained boys and girls for life in the community of small proportions. Community relationships are assuming new proportions under modern educational conditions.

In view of the above philosophy this study will approach the task of curriculum building with an evaluation of present school practices and from the point of view of community analysis. It is recognized that not all factors in the life of the community can be studied. Factors selected have been chosen in terms of the purpose of education in American democracy.

It is difficult to evaluate an educational program or to analyze a community without reference to the product of the institution. The author is cognizant of the fact that such a procedure may lead to the conclusion that students become what they do after school life is over because of the school program. However, the mobility of the school population tends to offset the influence of the school program pretty largely. On the other hand, knowledge must be obtained concerning the vocational opportunities open to young people in the community. Many young people never leave the community, hence know nothing of vocational opportunities outside the local community.

An attempt has been made to select factors capable of objective interpretation and measurement. The hope is that areas of school experience that need attention will be thrown into relief so that an adequate picture will be obtained. A wide variety of factors could have been selected for the purpose of this study. No doubt factors were omitted that would have been equally valuable but because of their lack of direct relationship were not included. Selection of items was done with a view to further studies in the area of community analysis.

The measures selected are herewith presented with some discussion as to methods of handling data:

- A. An analysis of vocations that have been selected by graduates and nongraduates from the classes of 1920, 1928, 1930, 1932, 1934, and 1936
- (1) What additional training was taken following high school?
 - (2) Where do graduates spend their adult lives?
 - (3) Comparison of the vocations of graduates and nongraduates.
 - (4) Comparison of the school subjects of various vocational groups. Also comparison of the high school marks received by pupils entering professions and other vocations.
 - (5) Conditions of home during high school attendance.
 - (a) Were parents living together?
 - (b) Parents divorced?
 - (c) Parents dead?
 - (6) Effect of the vocation of parents upon the selection of vocation by the child.
 - (7) Work experience of the pupil during high school attendance.
 - (8) From whom did pupils seek advice in making vocational choices?
 - (9) Present scale of wages.
 - (10) Vocation in which at present engaged.

Most of the material for this part of the study will be obtained from the school records and from the graduates who live in the community. For the graduates who do not live in the community, it will be possible to secure the necessary information through the use of the questionnaire. Much of the information relative to the classes under consideration has already been collected through the efforts of a Works Project Administration project carried on under the direction of the school. Information for nongraduates may be secured in a similar manner.

Selection of the specific classes was done with the idea in mind of determining the effect of the depression years upon the additional training secured and the vocational choices of fairly recent classes. The class of 1936 was taken in order to give students an opportunity to complete four years of college beyond high school graduation and thus actually to have selected some vocation by which to earn a living. Inclusion of the class of 1920 will serve to give comparative data relative to additional training and vocations selected. It will serve to denote whether or not certain vocations now enjoy greater choice than formerly.

B. A survey of the vocational opportunities represented in the community

- (1) Types of industries and businesses represented
- (2) Professions actually represented by workers in each area
- (3) Opportunities for employment in each classification

Material for this part of the study has already been fairly well collected by the Works Project Administration referred to above. Each of the items mentioned above will be tabulated in terms of the people actually engaged

in earning a living in the community under each type of establishment. Some effort will be made to determine whether or not all possibilities have been exhausted for a further expansion in each vocational classification. This part of the study will likely be based in part on the opinions of those engaged in vocations represented and will in that respect be subjective.

3. PROBABLE CHAPTER HEADINGS

- Chapter I The Problem
- Chapter II Method of Attack
- Chapter III The Adult Activities of Graduates and Nongraduates
- Chapter IV Vocational Opportunities in the Community
- Chapter V Conclusions and Recommendations

4. REVIEW OF THE WRITTEN MATERIALS IN THE FIELD

(This is a critical analysis and evaluation of 27 pertinent items of bibliography related to the principal aim of the research project.)

7. Creative Research

*A Demonstration and Evaluation of the Principles of Art Structure
by the Execution of a Mural*

Estelle Stinchfield

Problem

1. To demonstrate the essential principles of Art Structure which underlie painting by the execution of a mural.
2. To analyze this mural so that the principles involved may be clear to the student of Art.

Thesis

The mural painting, because of the comprehensiveness of its many problems, offers an ideal means to demonstrate the integration and synthesis of Art Structure.

Objectives

Proximate

Through preliminary experiment to weigh, compare, and integrate more fully the writer's Art Education which has been received from professional Art study under instructors, experience as a painter and art teacher, study of collections of pictures in galleries, and reading in the field, in order that the ultimate objective of the thesis may be realized.

Ultimate

To demonstrate and visualize concretely for the benefit of students of painting the principles of art structure used by the writer in painting a mural.

PROCEDURES

The execution of a mural panel for Guggenheim Hall

TECHNIQS

Artists whose class notes and lectures are quoted.

PROCEDURES

together with the analysis of the methods of procedure involved therein.

Preliminary Study

- I. Review and statement of the principles learned and tested through the class instruction of different artists.

TECHNIQS

Tudor-Hart, Percival, Artist, Lecturer, and Instructor, London, England.

Summary of instruction and class notes:

I.

1. Adaptation of paper or canvas to the form and emotional content of the subject through:
 - a. Focalization
 - (1) Definition—
 - (2) Its functional use in placing the subject to interpret it emotionally.
 - (3) Its help in determining the functional rhythms in line, light and dark, and color in the subject.
 - (4) Its use in determining proportion in the drawing.
2. The analysis of value into its three structural groups:
 - a. Dark
 - b. Light
 - c. Middle
3. Color Theory based on the Musical chart.

Lhote, Andre, Critic at Academie Montparnasse, Paris. Lecturer at the New Sorbonne, Paris.

Organization of form:

1. Analysis of the use of the four fundamental directions of line.
The integration and equilibration of these to keep the composition dynamic and three-dimensional. In other words, to poise form in space.
2. How to build form sculpturally by:
 - a. Plane impingement.
 - b. The use of axes to turn volumes.
 - c. The functional use of the background with the motif.
 - d. The functional use of curved and straight directions of lines to bound flat planes in building form.
 - e. The analysis of cool and warm color in painting.

PROCEDURES

TECHNIQUES

- f.* Color distribution and zoning to keep the composition dynamic.

Friesz, Othon, critic at the Academie Moderne, Paris, France.

1. Emphasis on many of the points above.
2. The dynamic play of light over solid form.
3. Simplification of form.

Batchelder, Ernest

1. Statement of the Principles of Design:
Rhythm, Balance, Harmony, and their manifestations of shape, measure, and tone.
2. The relation of craftsmanship to design. How different design techniques are governed by and grow out of the material to which they are applied.

Dow, Arthur W., Former Head of the Department of Fine Arts, Teachers College, Columbia University, New York.

1. The conception of Art in terms of design. The Art Structural principles of beauty of line, light and dark, and color.

Summary of material described and the principles of art stated concisely.

II. Analysis of the organization of many of the great mural paintings of the world as studied

1. In the Art Galleries of England, France, Belgium, Holland, Italy, and America.
2. By prints and photographs.

II.

1. Pompeian:
Art Museum, Naples.
2. Cretan:
Replicas in the Fogg Museum, Harvard University.
3. Italian Primitive:
The National Gallery, London; the Louvre; the Galleries of Siena, Florence; the Boston Art Museum; the Metropolitan; the Chicago World's Fair.
4. Flemish Gothic:
Galleries of Belgium, Holland, Florence.
5. French Gothic:
Galleries of France and Italy.

PROCEDURES

TECHNICS

6. Renaissance:
Italian, French, Flemish, and Dutch: in the galleries of those countries.
7. 18th and 19th Century French:
The Louvre; the Petit Palais; the Luxemburg; the Wallace Collection, London.
8. Modern French:
The galleries of France; The Chicago World's Fair; The Barnes Foundation, Merion, Penna.
9. Modern American:
The World's Fair, Chicago.
Reproductions and photographs.
Shows in the galleries in New York.
10. Mexican:
Prints and photographs.
State accepted principles that run through the masterpieces of all these periods.

III. An annotated outline of the literature in the field read by the writer.

III. Annotated bibliography in tentative form.

A. Art

1. WRIGHT, WILLARD HUNTINGTON, *Modern Painting*. New York: John Lane Co., 1915. Some very excellent analyses of distinctions between two and three dimensional rhythm. Quite a valuable discussion of the platforms of Modern Art.
2. This review of pertinent publications includes a total of 29 items, under the two headings, "Art" and "Architecture."

IV. Bibliography of local history providing a background for the subjects of the experiments and the subject chosen.

BOYD, DAVID, A.M., *History of Greeley and the Union Colony of Colorado*.

PROCEDURES

TECHNICS

ALLEN, MRS. GRACE, *Pioneer Stories of Mountain and Plain*. Unpublished Manuscript.

HOWARD, SARAH ELIZABETH, *Pen Pictures of the Plains*. Denver: The Reed Publishing Co.

CLARK, J. MAX, *Colonial Days*. Denver: Smith Brooks.

V. Years of experience in painting in watercolor, oil, tempera, and experiment in fresco.

V. This experience is necessary in developing a technique and style to enable one to paint a mural.

VI. Personal interviews with experienced mural painters of Colorado:

VI. These interviews are very helpful in gaining useful practical suggestions as to methods of work,

1. Thompson, John E.
Professor of Art, University of Denver; and Mural Painter.

2. Olson, Albert, Mural Painter.

3. Trucksees, F. C.
Professor of Art, University of Colorado, and Mural Painter.

4. Kirkland, Vance
Head of the Kirkland School of Art.

5. Ellinger, Richard G.
Associate Professor of Art, Colorado State College of Education, and Mural Painter.

Personal interviews with pioneers of Colorado who contributed historic information:

The interviews with pioneers of Colorado have contributed useful historical data for the theme.

1. Allen, Mrs. Grace
Author of *Pioneer Stories*.

2. Greenacre, Mrs.
Teacher in the Greeley Public Schools.

PROCEDURES

3. Copeland, A. B.
Curator of Greeley Museum; former Superintendent of Schools, Greeley.
4. Gilliland, Mrs. Maud Mecker
Niece of Nathan Mecker, Founder of the Greeley colony.
5. Witwer, Harvey E.
City Treasurer, Greeley.

TECHNICS

VII. Painting of the mural and writing of the analysis.

VII. Chapter Headings

PREFACE

Introduction

1. Statement of Problem
2. The Thesis
3. Method of Attack
4. Brief Summary

CHAPTER ONE

Description of Preliminary Preparation.

1. Choice of medium;
oil
fresco
tempera
(Oil chosen)
2. Choice of Subject:
Basis:
(1) Suitability to mural treatment.
(2) Local interest to Greeley.
Subject:
"The Coming of the Water to the Uplands."
3. Investigation and assembling of materials needed.
Paper for cartoons
Drawing materials
Canvas—mounting on wall
Paint-brushes
Medium
Scaffolding

PROCEDURES

TECHNIQS

CHAPTER TWO

Description of experimental studies in line, light and dark, and color of usable themes. Choice of the best of these to carry out in the mural. Explanation of why "The Coming of the Water to the Uplands" was chosen as the theme.

CHAPTER THREE

1. Composition of the whole. Analysis of this according to art structure.
2. Preliminary large drawings of different units of the composition for form. Analysis of the construction of these units.
3. Drawing of the large cartoon.
 - a. Choice of medium for drawing.
 - b. Enlargement of smaller sketch.
 - c. Development of units and addition of relevant detail for enrichment
 - d. Development of the light and dark in the large cartoon. Analysis.
 - e. Perforating the cartoon to pounce it onto the canvas.

CHAPTER FOUR

Choice and Analysis of the color scheme (Tudor-Hart's color theory).

The preliminary trial of the color scheme on the small sketch.

CHAPTER FIVE

Painting of the Mural.

1. Mixing the principal colors. (Keep these fresh under water.)
2. Laying in of whole.
3. Development and finishing of parts.

CONCLUSION

Interpretation of mural as a model exemplifying the originally stated principles.

8. Curriculum Research

A Study of Vocabulary Found in Children's Literature in Relation to Certain First Grade Basic Readers

Nellie E. Zeman

Problem

In the field of children's literature few books with a vocabulary content parallel to that of the first grade reading level have been available. The recent trend toward placing importance on adequate provision for children's contact with good literature has made primary teachers conscious of the necessity for determining books the child can read successfully.

Purpose

The purpose of this study is to determine whether ten children's books which meet the criteria of accepted children's literature have a vocabulary which parallels the vocabulary of the two series of readers read by first grade pupils in the Public Schools of Topeka, Kansas.

PROCEDURES

- I. Read the material in the field of children's literature.

TECHNICS

- I. Bibliography in tentative form.

A. Books

1. WEEKS, BLANCHE E., *Literature and the Child*. Chicago: Silver, Burdett and Company, 1935. The purpose of this book is to widen and deepen experience through the presentation of factual materials. It is hoped that it will be a help to those who are called upon to guide children in reading.

Reading material should not be too difficult in comparison with the reading content of basal reading material but should challenge the reading skill of a child.

Literature should be read with ease and fluency to be appreciated. Therefore attention should not be focused on the mechanics of reading.

2. BECKER, MAY LAMBERTON, *First Adventures in Reading*. New York: Frederick A. Stokes Company, 1936. The author deals

PROCEDURES

TECHNICS

with every child as an individual child in reading. In her book she gives a list of books which every child should be exposed to sometime during his childhood.

In selecting books for the very young reader the author would choose books with a vocabulary that would parallel that of his reading vocabulary. The vocabulary in the first books he tries to read by himself should be readily recognizable.

3. FRANK, JOSETTE, *What Books for Children?* New York: Doubleday, Doran and Company, Inc., 1937. The author looks upon the child as an individual developing his own personality as a member in civilization with reading playing a most significant part. Books are considered the useful devices for stimulation and inspiration. Miss Frank gives a suggested list of books for children.
4. American Library Association, WILKINSON, MARY S., Chairman, *The Right Book for the Right Child*. New York: John Day Company, 1937. This book contains a composite list of books for children. It includes a pre-school list of picture books, books to read aloud to children, and books for children to read themselves from the time they enter school until they leave high school. The books have been graded as to the degree of reading ability a child must have attained in order to

PROCEDURES

TECHNICS

read them intelligently and fluently. They have been graded in accordance with highly significant elements of vocabulary and sentence structure.

5. BONEY, C. DEWITT, *A Study of Library Reading in the Primary Grades*. New York: Columbia University, Teachers College Series, 1933. This is a study of library reading. The author has concluded that children should be given freedom to select from well-chosen books the book of his own interest. Hence there will be a more natural approach toward development of interest in literature.

B. Periodicals

1. ARBUTHNOT, MAY HILL, "Literature and Reading," *The Elementary English Review*, 17: 3-8, 1940. This article states the importance of the relation between reading and literature. Literature must be genuinely enjoyable to have the desired effect upon children. The child must be able to read and enjoy the material. It must also be vigorous and alive. The books read by children must be excellent from the literary standpoint. The author points out that if literature has these qualities it motivates drill, enriches language experience, and stimulates curiosity.
2. SMITH, JEAN GARDINER, "On Choosing Books for Children," *The Elementary English Review*, 20: 209-213, 1943. The criteria for choosing books for children is given in this article, including important fundamen-

PROCEDURES

TECHNICS

tals that should be kept in mind when choosing books. One important criterion is that there must be books for children to grow on. Books must help children to increase in language skill and in a feeling for words.

3. STORM, GRACE E., "Areas of Children's Literature," *The Elementary School Journal*, 45: 503-511, 1945. Miss Storm gives the types of stories that children like to read at different ages. Children turn to reading to satisfy curiosity and to supply answers to questions. They use reading as a delightful adventure. To be suitable, the reading materials with which they come in contact will draw from every phase of life.
4. GRAY, WILLIAM S., Educational News and Editorial Comment, "Stress on Children's Literature," *The Elementary School Journal*, 44: 497-509, 1944. Dr. Gray stresses in this article that much importance has been placed on adequate provision for children's contact with good literature in the reading programs in the elementary schools.

C. Materials

1. *The Horn Book Magazine*. Boston: The Horn Book, Inc. This magazine contains books and reading for children and young people.

The Horn symbol against the title indicates that the book is outstanding in excellence on three counts—text, illustration, and book making.

2. *Wilson Library Bulletin*. New York: The H. W. Wilson Company. This bulletin gives the

PROCEDURES

TECHNICS

- most outstanding books for children according to their criteria.
3. *The Elementary English Review*. Chicago: National Council of Teachers of English. This magazine gives a review of books for children.

Methods of Investigation

- A. Alphabetize the vocabulary used in the two series of readers used by first grade pupils in the Public Schools of Topeka, Kansas.
- B. Select the children's literature books to be used for this study.
1. Recommendations made by the following periodicals will be used as criteria for judging the literary value and the grade placement of the books selected for the study.
 - a. *The Horn Book*
 - b. *Wilson Library Bulletin*
 - c. *The Elementary English Review*
- C. Alphabetize or determine the vocabulary of the books selected.
- D. Determine the extent to which each book contains words included in the readers in order that the child may read it in an understanding manner.
- E. List the books in order of difficulty.

SUGGESTED CHAPTER TITLES

- CHAPTER I INTRODUCTION
- CHAPTER II ORGANIZATION OF INVESTIGATION
- CHAPTER III RESULTS OF INVESTIGATION
- CHAPTER IV SUMMARY AND CONCLUSIONS

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